

BOYLE
ORIGINE OF
FORMES &
QUALITIES







15 025 / A



O
FOR
(Acco
phy,

(Writte

RO

Andradu
more affeque
and cam po

Printed b
for R I

772.52

THE
ORIGINE
John OF *Blake*
FORMES and QUALITIES,
Winchester.
(According to the *Corpuscular Philoso-*
phy.) Illustrated by *Considerations* and
EXPERIMENTS,

(Written formerly by way of *Notes* upon an
Essay about NITRE)

By the Honourable
ROBERT BOYLE,
Fellow of the *Royal Society*.

*Audendum est, & Veritas investiganda; quam etiam si
non assequamur, omnino tamen propius, quàm nunc sumus,
ad eam perveniemus. Galen.*

OXFORD,

o

Printed by H. HALL Printer to the University,
for RIC: DAVIS. An. Dom. MDCLXVI.



Novemb. 2. 1665.

Imprimatur

ROBERTUS SAY,

VICECANCELLARIUS

OXON.





The Publisher to the Ingenious Reader.

IN this curious and inquisitive Age, when men, altogether dissatisfied and wearied out with the wranglings and idle speculations of the Schools, are with equal zeal and industry so earnest in their quest and pursuit of a more solid, rational, and useful Philosophy, it may prove a work very obliging and meritorious to help and guide them in their studies and researches, and to hang out a Light to them, (as the Egyptians used to do from their highly celebrated Pharos, for direction to the Mariners, that sailed in those dangerous Seas near Alexandria,) whereby they may, with better success, steer their course through the vast Ocean of Learning, and make more full and perfect Discoveries of hitherto unknown Philosophical verities: which has been the chief Design of this Gentleman of Honour, the most excellent and Incomparable Author in this Treatise now presented to your view, wherein Principles are not (as was the mode and guise of former times) obtruded on the World upon the account of a Great Name, or involved in cloudy and mystical Notions, which put the Understanding upon the Wrack, and yet when

The Publisher to the Reader.

with all this labour and toile of the Brain they are at last known, prove impertinent and uselesse to the making out with satisfaction, or so much as tolerably, the ordinary Phænomena, which Nature every day presents the world with, but such as are built upon the firme and immoveable foundation of Reason, Sense, and Experience, plain and obvious as well to the Eye as the Understanding, and no less accurate and certain in their Application. And though the most noble Author hath herein, for the main, espoused the Atomical Philosophy (corrected and purged from the wild fancies and extravagancies of the first Inventours of it, as to the Origine of the Universe, and still imbraced with so much kindness and tenderness by some Pretenders, against which He hath so Learnedly disputed in his first part Of the Usefulness of Experimental Philosophy, p. 74. &c.) in explicating the Appearances; yet considering the several Alterations and Additions (the happy product of his penetrating judgment) made therein, I may not scruple to call it a New Hypothesis, peculiar to the Author, made out by daily Observations, familiar Proofs and Experiments, and by exact and easily practicable Chymical processes. whereby one of the most abstrusest parts of Natural Philosophy, the Origine of Forms

The Publisher to the Reader.

Forms and Qualities, which so much vexed and puzzled the Antients, and which, I would speak with the leave of the Cartesians, their Ingenious Master durst scarce venture upon, or at least was unwilling to handle at large, is now fully cleared, and become manifest: so that from this very Essay we may well take hope, and joyfully expect to see the noble Project of the famous VERULAM (hitherto reckoned among the Desiderata) receive its full and perfect Accomplishment, I mean, a real, useful, and experimental Physiology established and bottomed upon easie, true, and generally received Principles. But I shall not forestall thy judgment either about the Excellency of the Author, or his Subject, who hath so freely communicated to the World those treasures of Learning, wherewith his Mind is enriched, but shall soon refer you to the Work it self, after I have given you these few Advertisements.

The following Discourse (as is easily perceivable by divers Passages thereof) being written, several years since, whole and entire, as now it is, I know not whether it will be worth while to intimate, that the Author, casually turning over of late a very recent Chymical Writer, found in one of his Treatises (divers of which he never to this day read over) a part of the Fifth Expe-

The Publisher to the Reader.

ment of the second Section; but, as He professes, (and sure is like to be believed,) he did not dream that That Chymist, or any other Author whatsoever had lighted on that part of the Experiment till a good while after he had made and examined That, among many others, concerning Salts, as may be easily guess'd by the peculiar uses and applications He made of it. And though He had met with so unlikely an Experiment in a Writer, who, whether he deserve it or no, has the ill fortune to be much accus'd of Insincerity, and some of whose more easie processes our Author (who yet is willing to spare his Name, and seems to think his works not useless) could not find to succeed, He should not have taken it upon his Authority, no more then he is wont to take other Processes, divers of which He yet in the general supposes may be true upon the relation of other Chymists; who by blemishing their Books by things untrue and justly suspicious, are not to be relyed on, nor much thanked by wary men. But twill probably appear lesse pertinent to adde any thing further on this subject, then to take notice, that when the Author had once consented to the Publication of the following Papers, He several times wish'd for an Opportunity to make the Experiments and Observations, He now presents to the Publick,

more

The Publisher to the Reader.

more full and compleat, then they were when address'd to a private Friend. But the Contagion, that drove him from the Places, where his Accommodations for repeating Experiments were, oblig'd Him to apply Himself to other Studies and Employments.

And upon the same account, though he afterwards found many of his Notes upon other parts of the Essay of Salt-petre, and have lying by him divers Papers concerning Sensible Qualities, and Sensation in general, and the Production of Second Qualities, together with a collection of Notes about Occult Qualities, and some other Subjects of kin to those of this Book; yet having, upon the freshly intimated Occasion, diverted his Thoughts to other Subjects, He will not engage himself to put together and communicate his Collections on these Subjects by any Publick promise.

Onely thus much perchance I may undertake for, if a fair Opportunity offer it self, that the Author may be induc'd to adde ere long, for the completion of this present Work, a Discourse of Subordinate Forms, wherein He, not finding that they have been by any one attempted to be explicated by the Corpuscularian Hypothesis, hath proposed an Account of them agreeable thereunto.

Furthermore, as the Author has in the follow-

The Publisher to the Reader.

ing Disquisitions aim'd not at the raising or a-
betting a Faction in Philosophy, but at the Dis-
covery of the Truth; so he is not so solicitous
what every sort of Reader will think of his At-
tempts, (which tis easie to foresee are not like to
be everwelcome to the Votaries of the School
Philosophy) as to refuse a Compliance with the
desires of his Friends, who have been long since
very earnest with him not to spend that time in
Replies to particular Persons, which might be
more usefully employ'd in pursuing further Dis-
coveries of Nature by Experiments. If he meet
with any cogent and material Objections against
any of his chief Opinions, He is enough a Lover
of Truth, to be dispos'd to think himself oblig'd
by those that shall shew him his Mistakes, and to
take occasion to reforme them. But if nothing
new or weighty be urg'd, He considers, that he
lives in an Age, wherein he has observ'd (even
in his Own case) that Truths, if recommended
by real Experiments, will in time make their own
way, and wherein live store of Ingenious Men,
who, for the main, approve the Opinions, and
probably will not dislike the Arguments he has
propos'd, and who being more at leisure then He
to write Polemical Books, will not silently suffer
what they judge Truth, to be triumph'd over, or
oppress'd by those, who, imploying usually but
Scho-

The Publisher to the Reader.

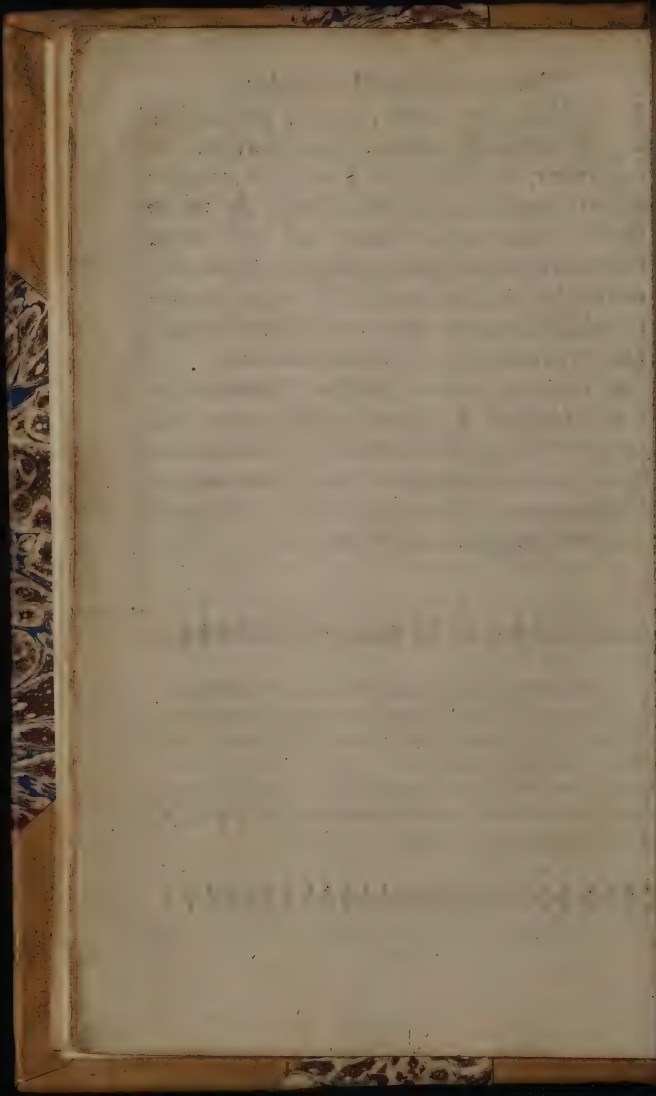
Scholastical Arguments, may be confuted by Answers of the like nature. And therefore He doubts not, but that some Learned Favourers of the Corpuscularian Philosophy (of which he hath endeavour'd to make out those parts, wherein they almost all agree) will be both able and willing to defend those Discoveries by rational Disputations, that they have not Opportunity to increase by New Experiments.

In the mean while I have no Temptation to doubt in the least, but that this curious and excellent Piece will be entertained and received by all that have any regard to the great concerns of Learning with that gust, delight, respect, and estimation which it so highly merits.



The following Treatise being printed in the absence of the Honourable Author, there has hapned (through the misplacing of the several Bundles writ apart fairly for the Press) a Dislocation at the 107. page, (as is there also intimated) where the first Section of the Historical part is placed, which should not have come in till p. 269. after the discourse of FORMS.







*The Proæmial Discourse to the Reader.**

AS tis the part of a Mineralist both to *discover* new Mines, and to *work* those that are already discovered, by separating & melting the Oares, to reduce them into perfect Metals; so I esteem, that it becomes a Naturalist, not onely to *devise* Hypotheses & Experiments, but to examine and *Improve* those that are already found out. Upon this consideration (among other Motives) I was invited to make the following Attempt, whose productions coming to be expos'd to other Eyes, then those for which they were first written, twill be requisite to give the publick some Account of the Occasion, the Scope, and some Circumstances. And this I shall do the more fully, because the reasons I am to render of my way of writing in reference to the Peripaterick Philosophy, must contain Intimations, which perhaps will not be useless to some sorts of Readers, (especially Gentlemen,) and

* The following *Preface* being addressd onely to *Pyrophilus*,

by

The Author to the Reader.

by being apply'd to most of those other parts of my Writings, that relate to the School Philosophy, may do Them good service, and save both my Readers and me some trouble of Repetitions.

Having four or five years ago publishd a little Physico-Chymical Tract about the differing parts and redintegration of Nitre, I found as well by other signes as by the Early solicitations of the Stationer for a new Edition, that I had no cause to complain of the Reception that had been given it: But I observed too, that the Discourse, consisting chiefly of Reflexions, that were occasionally made upon the *Phænomena* of a single Experiment, was more available to confirme those in the Corpuscularian Philosophy, that had already somewhat inquir'd into it, then to acquaint those with the principles and notions of it, who were utter Strangers to it; and as to many Readers, was fitter to excite a Curiosity for that Philosophy, then to give an Introduction thereunto. Upon this Occasion it came into my mind, that about the time when I writ that Essay about Salt-petre, (which was divers years before twas published) I had also some thoughts of a History of Qualities, and that having in loose Sheets set
down

The Author to the Reader.

down divers Observations and Experiments proper for such a Design, I had also drawn up a Discourse, which was so contriv'd, that though some parts of it were written in such a manner, as that they may serve for Expository Notes upon some particular passages of the Essay; yet those parts with the rest might serve for a *General Preface* to the History of Qualities, in case I should ever have Conveniency as well as Inclination to make the prosecuting of It my Business, and in the mean time might present That *Pyrophilus*, to whom I writ, some kind of Introduction to the principles of the Mechanical Philosophy, by expounding to him, as far as my Thoughts and Experiments would enable me to do, in few words, what, according to the Corpuscularian Notions, may be thought of the Nature and Origine of Qualities and Forms, the knowledge of which either makes or supposes the most fundamental and useful part of Natural Philosophy. And to invite me to make use of these Considerations and Tryals about Qualities and Formes, it opportunely happen'd, that though I could not find many of the Notes written about particular Qualities, (my loose papers having been, during the late Confusions, much scatter'd by the

The Author to the Reader.

the many Removes I had then occasion to make,) yet when last Winter, being urged to publish my History of Gold, (which soon after came forth,) I rumag'd among my Loose papers, I found, that the several Notes of mine that he had met with under various heads, but yet all concerning the Origine of Forms and Qualities, together with the Preface address'd to *Pyrophilus*, (though written at distant times and places) had two or three years before, by the care of an Industrious person, with whom I left them, been fairly copied out together, (which circumstance I mention, that the Reader may not wonder to find the following Book not written uniformly in one continued tenor,) excepting some Experiments, which having been of my own making, 'twas not difficult for me to perfect, either out of my Notes and memory, or (where I doubted their sufficiency) by repeated Tryals. So that if the Urgency, wherewith divers Ingenious Men press'd the publication of my new Experiments about Gold, and my unwillingness to protract it, till the Frosty season, that was fittest to examine and prove them, were all pass'd, had not prevail'd with me to let those Observations be made publick the last VVinter, they might have
been

The Author to the Reader.

been Accompanied with the present Essay of the *Origine of Qualities and Formes*, which may be premis'd to what *I* have written touching Any of the particular Qualities, since it contains Experiments and Considerations fit to be præliminary to them all.

But though *I* was by this meanes diverted from putting out the following Treatise at the same time with the History of Gold, yet *I* was without much difficulty prevail'd with not to alter my intentions of suffering it to come abroad; because divers of my Historical Accounts of some particular Qualities are to be reprinted, which may receive much Light and Confirmation by the things deliver'd in this present Treatise about Qualities and Forms in general. To which Inducement was added the Perswasion of some ingenious Persons, who are pleased to confesse their having receiv'd more Information and Satisfaction in these Papers then *I* durst pretend to give them: though indeed the Subject is so noble and important, and does so much want the being illustrated by some distinct and Experimental Discourse, that *not onely* if *I* did not suspect my Friends of Partiality, *I* should hope that It may gratify many Readers, and instruct more then a few: but such as it is, *I* doe

The Author to the Reader.

do not altogether despair, that it will prove neither unacceptable, nor uselesse. And indeed the doctrines of Forms and Qualities, and Generation, and Corruption, and Alteration are wont to be treated of by Scholastical Philosophers, in so obscure, so perplex'd, and so unsatisfactory a way, and their Discourses upon these Subjects do consist so much more of Logical and Metaphysical Notions and Niceties, then of Physical Observations and Reasonings, that it is very difficult for any Reader of but an ordinary Capacity, to understand what they mean, and no lesse difficult for any intelligent and unprejudic'd Reader to acquiesce in what they teach: which is oftentimes so precarious, and so contradictory to its self, that most Readers (without alwaies excepting such as are Learned and Ingenious) frighted by the darkness and difficulties wherewith these Subjects have been surrounded, do not so much as look after or read over these general and controverted matters, about which the Schools make so much noise; but despairing to find any satisfaction in the study of them, betake Themselves immediately to that part of Physicks that treats of particular Bodies: so that to These it will not be unacceptable to have any
Intel-

The Author to the Reader.

intelligible Notions offer'd them of those Things, which, as they are wont to be propos'd, are not wont to be understood: though yet the Subjects themselves, if I mistake not, may be justly reckon'd not onely amongst the noblest and most important, but (in case they be duely propos'd,) among the usefullest and most delightful Speculations, that belong to Physicks.

I consider too, that among those that are inclin'd to that Philosophy, which, I find, I have been much imitated in calling *Corpuscularian*, there are many Ingenious Persons, especially among the Nobility and Gentry, who, having been first drawn to like this new way of Philosophy, by the sight of some Experiments, which for their Novelty or Pretiness they were much pleas'd with, or for their Strangeness they admir'd, have afterwards delighted Themselves to make, or see variety of Experiments, without having ever had the Opportunity to be instructed in the Rudiments or fundamental Notions of that Philosophy, whose pleasing or amazing Productions have enamour'd them of It. And as Our *Pyrophilus*, for whom these Notes were drawn up, did in some regards belong to this sort of *Virtuosi*, so tis not impossible,

The Author to the Reader.

But that such Readers, as He was then, will not be sorry to meet with a Treatise, wherein though my chief and proper businesse be the giving some Account of the Nature and Origin of Forms and Qualities; yet by reason of the connexion and dependance betwixt these and divers of the other principal Things, that belong to the general part of Physicks, I have been oblig'd to touch upon so many other important Points, that this Tract may, in some sort, exhibit a Scheme of, or serve for an Introduction into the Elements of the Corpuscularian Philosophy.

And as those Readers, that have had the Curiosity to peruse what is commonly taught in the Schools about Forms, and Generation, and Corruption, and those other things we have been mentioning, and have (as is usual among ingenious Readers) quitted the study of those unsatisfactory Intricacies with Disgust, will not be displeas'd to find in our Notes such Explications of those things as render them at least intelligible: so it will not perhaps prove unacceptable to such Readers, to find those matters, which the Schools had interwoven with *Aristotle's* Doctrine, reconcil'd and accommodated to the Notions of the Corpuscular Physicks.

The Author to the Reader.

If it be said, that I have left divers things unmention'd, which are wont to be largely treated of by the *Aristotelians*, and particularly have omitted the Discussion of several Questions, about which they are wont very solemnly and eagerly to contend, I readily acknowledge it to be true: But I answer further, That to do otherwise then I have done, were not agreeable to the nature of my Design, as is declar'd in the Preface to *Pyrophilus*; and that though most Readers will not take notice of it, yet such as are conversant in that sort of Authors, will, I presume, easily find, that I have not left them unconsulted, but have had the Curiosity to resort to several both of the more, and of the lesse recent Scholastical Writers about Physicks, and to some of the best Metaphysicians to boot, that I might the better inform my self, both what their Opinions are, and upon what arguments they are grounded. But as I found those Inquiries far more troublesome then useful, so I doubt not, that my omissions will not much displease that sort of Readers, for whose sake chiefly tis that these Papers are permitted to be made publick. For if I should increase the Obscurity of the Things themselves I treat of, by adding the several Obscure

The Author to the Reader?

rer Comments (rather then Explications,) and the perplex'd and contradictory Opinions I have met with among Scholastick Writers; I doubt that such persons, as I chiefly write for, would instead of better comprehending what I should *so* deliver, absolutely forbear to read it. And there being many Doctrines, to which number This we are speaking of seems to belong, wherein the same innate Light, or other Arguments, that discover the Truth, do likewise sufficiently shew the Erroneousness of dissenting Opinions, I hope it may suffice to propose and establish the Notions that are to be imbrac'd, without solicitously disproving what cannot be true, if those be so. And indeed there are many Opinions and Arguments of good repute in the Schools, which do so entirely rely upon the Authority of *Aristotle*, or some of his more celebrated Followers, that where that Authority is not acknowledg'd, to fall upon a solemn Confutation of what has been so precariously advanc'd, were not onely unnecessary, but indiscreet even in a Discourse not confin'd to the brevity challeng'd by the nature of this of Ours. And there are very many Questions and Controversies, which though hotly and clamorously contended about,

The Author to the Reader.

about, and indeed pertinent and fit enough to be debated in their Philosophy, do yet so much suppose the Truth of several of their Tenents, which the new Philosophers reject, or are grounded upon Technical Terms or forms of speaking, that suppose the Truth of such Opinions, or are Expressions, whereof we neither do, nor need make any use; that to have inserted such Debates into such a Discourse as mine, would have been not onely tedious, but impertinent. As (for instance) those grand Disputes, whether the four Elements are endow'd with distinct Substantial Forms, or have onely their proper Qualities instead of them? and whether they remain in mix'd Bodies according to their Forms, or according to their Qualities? and whether the former or the latter of those be, or be not refracted? These, I say, and divers other controversies about the four Elements, and their manner of Mixture, are quite out of doors in their Philosophy, that acknowledge neither, that there are four Elements, nor that Cold, Heat, Dryness, and Moisture, are, in the Peripatetick sense, first Qualities, or that there are any such Things as Substantial Forms *in rerum natura*. And it made me the more unwilling to stuff these Papers with any needless

The Author to the Reader.

School-controversies, because I found, upon perusal of several Scholastick Writers, (especially the recenter, who may probably be suppos'd to be the most refin'd,) that they do not alwaies mean the same Things by the same Terms, but some imploy them in one sense, others in another, and sometimes the same Writer uses them in very differing senses; which I am oblig'd to take notice of, that such Readers, as have consulted some of those Authors, may not accuse me of mistaking or injuring some of the Scholastical Terms and Notions he may meet with in these Papers, when I have onely imploy'd Them in the sense of other School-writers, which I judg'd preferable. And this puts me in mind of intimating, That whereas, on the contrary, I sometimes imploy variety of Terms and Phrases to express the same Thing, I did it purposely, though perhaps to the prejudice of my own Reputation, for the Advantage of *Pyrophilus*; both I and others having observed, that the same unobvious Notions being several wayes express'd, some Readers even among the Ingeniouser sort of them, will take it up much better in one of those Expressions, and some in another.

But perhaps it will be wondred at, even by
some

The Author to the Reader.

some of the new Philosophers, That dissenting so much as I do from *Aristotle* and the Schoolmen, I should overlook or decline some Arguments, which some very ingenious Men think to be of great force against the Doctrine I oppose. But divers of these Arguments being such, as the Logicians call *ad hominem*, I thought I might well enough spare them. For I have observ'd *Aristotle* in his Physicks to write very often in so dark and ambiguous a way, that tis far more difficult, then one would think, to be sure what his Opinion was: and the Unlearned, and too frequently jarring Glosses of his Interpreters, have often made the Comment darker then the Text: so that (though in most it Be, yet) in divers cases tis not easie (especially without the expence of many words) to lay open the Contradictions of the Peripatetick Doctrine; besides, that the urging such contradictions are oftentimes fitter to silence an unwary Adversary, then satisfy a wary and judicious Reader. It being very possible, that a man may contradict himself in two several places of his Works, and yet not be in both of Them in the wrong. For one of his Assertions, though inconsistent with the other, may yet be consistent with Truth. But this

The Author to the Reader.

is not all I have to say on this Occasion. For besides, that having, for many reasons, elsewhere mention'd, purposely forbore the reading of some very much, and, for ought I know, very justly Esteem'd Discourses about general *Hypotheses*, tis very possible, that I may be a stranger to some of those Arguments: besides this, I say, I confess I have purposely forbore to make use of others, which I have sufficiently taken notice of. For some of those Ratiocinations would engage him that should imploy them, to adopt an *Hypothesis* or Theory, in which perhaps I am not so thoroughly satisfied and of which I do not conceive my self to have, on this occasion, any necessity to make use: and accordingly I have forbore to imploy Arguments, that are either grounded on, or suppose Indivisible Corpuscles, call'd *Atoms*, or any innate motion belonging to them; or that the Essence of Bodies consists in Extension, or that a Vacuum is impossible; or that there are such *Globulicælestes*, or such a *Materia subtilis*, as the Cartesians imploy to explicate most of the *Phænomena* of Nature. For these, and divers other Notions, I (who here write rather for the Corpuscularians in general, then any party of them) thought it improper needlessly
to

The Author to the Reader.

to take in, discoursing, either against those, to whom these things appear as disputable, as the Peripaterick Tenents seem to me; or for to satisfy an Ingenious person, whom it were not fair to impose upon with *Notions*, that I did not my self think proper.

And on the like Account I forbore such *Arguments* as those, that suppose, in Nature and Bodies inanimate, Designs, and Passions proper to Living, and perhaps peculiar to Intelligent Beings; and (such as) some Proofs that are drawn from the Theology of the Schools: (which I wish lesse interwoven with *Aristotle's* Philosophy.) For though there be some things, which seem to be of this sort, (as Arguments drawn from final causes in divers particulars that concern Animals,) which, in a sound sense, I not onely Admit, but Maintain: yet since, as they are wont to be propos'd, they are liable enough to be question'd, I thought it expedient for my present design to pratermit them, as things that I do not absolutely need; though the imploying some of Them would facilitate my Task. And this I did the rather, because I also forbear to answer Arguments, that however vehemently and subtly urg'd by many of the modern Schoolmen of the Roman Catholick Commu-
nion

The Author to the Reader.

nion, are either confessedly, or at least really built upon some Theological Tenents of theirs, which, being oppos'd by the Divines of Other Churches, and not left unquestion'd by some Acute ones of their Own, would not be proper to be solemnly taken notice of by Me, whose Business, in this Tract, is to discourse of Natural Things as a Naturalist, without invading the Province of Divines, by intermeddling with Supernatural Mysteries, such as those, upon which divers of the Physico-Theological Tenents of the Schoolmen, especially about real Qualities, and the Separableness of Accidents from Subjects of Inhesion, are manifestly, if not also avowedly, grounded. But to return to the other things I was owing to have left unmention'd; notwithstanding all that I have been saying, I readily acknow-

** Atque hæc sententia (of the Distinction and Separableness of Quantity from Matter) est omnino tenenda: quanquam enim non possit ratione naturali sufficienter demonstrari, tamen ex principiis Theologia convincitur esse vera, maxime propter mysterium Eucharistiæ: Suarez disp. Metaph 40. p. m. 341. paucisq; interjectis, — prima ratio pro hac sententia est, quia in mysterio Eucharistiæ Deus separavit quantitatem à substantiis panis & vini, &c. & p. m. 342. — Hæc responsio & sententia [Adversariorum] sic explicata non potest facile & evidenter impugnari, si sesto in puro naturali; nihilominus tamen, partim ratione naturalis, partim adjuncto mysterio sufficientissime improbat.*

ledge,

The Author to the Reader.

I ledge, that in some recent Authors, that have been imbracers of the new Philosophy, I have met with some passages, that might well and pertinently be taken into the following Discourse, but that having been (as I formerly intimated) transcrib'd some years ago, I cannot now so conveniently Alter it: which I am the lesse troubled at, because these few additional Arguments, thought fit to illustrate or confirme, being not necessary to make out what has been deliver'd, may safely be let alone, unlesse there happen (as tis not unlikely there may) an occasion of reprinting these Notes, with such Enlargements as may make them the more fit to be an Introduction into the Corpuscular Philosophy.

I hope then upon the whole matter, that I have pitch'd upon that way, that was the most conducive to my Design, *partly* by insisting onely on thole Opinions, whether true or false, which, for their Importance or Difficulty, seem'd to deserve to be particularly either explicated or disprov'd; and *partly*, by choosing to imploy such Arguments as I thought the clearest, and cogentest, and by their assuming the least of any, seem'd the easiest to be vindicated from Exceptions: without troubling my self to answer Objections, that appear'd

The Author to the Reader.

pear'd rather to be drawn from Metaphysical or Logical Subtleties, or to be grounded upon the Authority of men, then to be Physical Ratiocinations, founded upon Experience, or the nature of the Things under debate; especially having, in the proposal and confirmation of the Truth, so laid the grounds, and intimated the wayes of answering what is like to be colourably objected against it, that an Ingenious man may well enough furnish himself with Weapons to defend the Truth, out of the Notions, Hints, and Experiments, wherewith in this Tract care has been taken to accompany it. And my forbearing to prosecute some of the Peripatetick Controversies any further then I have done, will not, I hope, be blam'd by Them, that have observ'd as well as I, how much those Disputes are wont to be lengthned by such frivolous Distinctions, as do not deserve to be solemnly examin'd, especially in such a Compendious Treatise as Ours. For an attentive Reader needs not be much conversant with the writings of the modern Peripateticks, about such subjects as Substantial Forms, Generation, Corruption, &c. to take notice, that tis their Custome, when they find Themselves distress'd by a solid Argument,

The Author to the Reader.

to endeavour to elude it by some pitiuſſ Diſtinction or other, which is usually ſo groundleſſe, and ſo unintelligible, or ſo nugatory, or ſo impertinent to the Subject, or at leaſt ſo inſufficient for the purpoſe tis alleadg'd for, that to vouchſafe it a ſollicitous Contutation might queſtion a Writers Judgment with intelligent Readers; who by ſuch inſignificant Diſtinctions are ſatisfy'd of nothing ſo much, as that the Framers of them had rather ſay (that which indeed amounts to) nothing, then not ſeem to ſay ſomething. And of ſuch Eviſions they may probably be emboldned to make uſe, by the practice of *Ariſtotle* himſelf, to whom ſuch obſcure and unſatisfactory Diſtinctions are ſo familiar, that I remember one of his own Commentators * (and he one of the moſt judicious) could not forbear, upon a certain Text of his Maſters, to complain of

* The Author here meant is the Inquiſitive Peripatetic *Cabeus*, who in one place hath theſe words. *ut hanc quaſtionem ſolvat, recurrit ad illam diſtinctionem ſibi valde familiarem; quā utitur Ariſtoteles in tota ſua Philoſophia, quoties obviam habet aliquam gravem difficultatem; diſtinguit enim actu vel potentia, &c.* In another theſe: — *Quæ eſt diſtinctio quædam familiaris Ariſtoteſi, quam applicat omnibus rebus, ubi difficultates urgent, & videtur iſtis vocibus quaſi fatali gladio omnes reſcindere difficultatis nodos; vix enim eſt difficultas, cui non putat ſe ſatisfacere diſtinguendo actu & potentiâ.*

it,

The Author to the Reader.

it, and particularly to take notice, that That one Distinction of *actū & potentia* runs through almost all *Aristotle's* Philosophy, and is imploy'd to shift off those Difficulties he could not clearly Explicate.

By which nevertheless I would not be understood to censure or decry the whole Peripaterick Philosophy, much lesse to despise *Aristotle* himself; whose own Writings give me sometimes cause a little to wonder, to find some Absurdities so confidently father'd upon him by his Scholastick Interpreters. For I look upon *Aristotle* as one (though but as one amongst many) of those fam'd Antients, whose Learning about *Alexanders* time enobled *Greece*; and I readily allow him most of the prayes due to great Wits, excepting those which belong to clear-headed Naturalists. And I here declare, once for all, that where in the following Tract, or any other of my writings, I do indefinitely depreciate *Aristotle's* Doctrine, I would be understood to speak of his *Physicks*, or rather of the Speculative part of them, (for his Historical VVritings concerning Animals I much esteem,) nor do I say, that even These may not have their Use among Scholers, and even in Universities, if they be retain'd and studied with due cautions

The Author to the Reader.

ons and Limitations, (of which I have elsewhere spoken.)

But to resume the Discourse, whence the Peripatetick Distinctions tempted me to digress; by any thing I formerly said, I would not in the least disparage those excellent and especially those modern Authors, that have professedly opposed the Aristotelian Physicks: (such as *Lucretius*, *Verulam*, *Basso*, *Des Cartes* and his Followers, *Gassendus*, the two *Boots*, *Magrenus*, *Pemle*, *Helmont*,) nor be thought to have made no use of any of their Cogitations or Arguments. For though some of their Books I could not procure, when I had occasion to have recourse to Them; and though the weakness of my Eyes discourag'd me from perusing those parts of others, that concern'd not the Subject I was treating of, yet I hope I have been benefitted by those I have consulted, and might have been more so, by the Learned *Gassendus's* Little, but Ingenious, *Synagma Philosophiæ Epicuri*, if I had more seasonably been acquainted with it.

But whether we have treated of the Nature and Origine of Forms and Qualities in a more comprehensive way then others, whether we have by new and fit Similitudes, and Examples, and other means rendred it more intelligible

The Author to the Reader.

ligible then they have done, *whether* we have added any considerable number of Notions and Arguments, towards the compleating and confirming of the propos'd *Hypothesis*, *whether* we have with reason dismiss'd Arguments unfit to be relyd on, and *whether* we have propos'd some Notions and Arguments so warily, as to keep Them from being lyable to Exceptions or Evasions, whereto they were obnoxious as others have propos'd them, *whether* (I say) we have done all or any of these in the first or Speculative part of this Treatise, we willingly leave the Reader to judge: But in the second or Historical part of It, perhaps he will be invited to grant, that we have done that part of Physicks, we have been treating of, some little service: since by the Lovers of real Learning, it was very much wish'd, that the Doctrines of the new Philosophy (as tis call'd) were back'd by particular Experiments; the want of which I have endeavour'd to supply, by annexing some, whose Nature and Novelty I am made believe will render them as well Acceptable as Instructive. For though, that I might not anticipate what belongs to other papers, I did not make the Last *Section* consist of above a Decad of them; and though, for the reasons

inti-

The Author to the Reader.

intimated in the Advertisements premis'd to them, I did not expressly mention to *Pyrophilus* all that I could have told him about them; yet I have been carefull so to choose them, and to interweave Hints in delivering them, that a sagacious Reader, who shall have the Curiosity to try them heedfully, and make Reflexions on the several *Phanomena*, that in likelihood will occur to him, will (if I mistake not) receive no contemptible information, as of some other things, so particularly about the nature of Mixtions, (which I take to be one of the most important and useful, though neglected and ill understood, Doctrines of the Practical part of Physicks) and may probably light upon more then he Expects, or I have fully Delivered, and perhaps too more then I Foresaw.

And though some *Virtuosi*, more conversant perhaps with Things then Books, presuming the Decay of the Peripatetick Philosophy to be every where as great, as tis among Them in *England*, may think that a Doctrine, which they look on as Expiring, need not have been so solicitously confuted: yet those that know, how deep rooting this Philosophy has taken (both elsewhere, and particularly) in those Academies, where it has

The Author to the Reader.

flourish'd for many Ages, and in some of which tis, exclusively to the Mechanical Philosophy, water'd and fenced by their Statutes or their Superiours: and he that also knows, how much more easie some (more subtle, then Candid) Wits, find it plausibly to defend an Error, then ingeniously to confess it, will not wonder, that I should think, that a Doctrine so advantag'd, though it be too erroneous to be Fear'd, is yet too considerable to be Despis'd. And not to question, whether several of those, that most condemn the favourers of the Peripatetick Hypothesis, as the later Discoveries have reduc'd them to Reform it, be not the least provided to answer their Arguments: (not to question this, I say,) there are divers of our Adversaries (misled onely by Education, and morally harmless prejudices) who do so much Deserve a better Cause, then that which Needs all their subtlety without being VVorthy of it, that I shall think more paines, then I have taken, very usefully bestow'd, if my Arguments and Experiments prove so happy, as to undeceive Persons, whose parts, too unluckily confin'd to Narrow and Fruitless Notions, would render them illustrious Champions for the Truths they are able so Subtly to oppose, and who might

The Author to the Reader.

might questionless perform Considerable things, if they imploy'd as much Dexterity to Expound the Mysteries of Nature, as the Riddles of the School-men; and laid out their VVit and Industry to surmount the Obscurity of Her works in stead of that of *Aristotles*.

There might be a few other particulars fit to be taken notice of in this Preface, but finding that I had already mention'd them in that, which I had address'd to *Pyrophilus*, my Hast makes me willing rather to refer the Reader thither for them, then Alter that, or Lengthen this; (which I should think much too Long already, if it were not possible that it may hereafter prove præliminary to more papers then these tis now premis'd to.) So that there remains but one Advertisement necessary to be given here, namely, that whereas in the following Notes I several times speak of the Author of the Essay of Salt-petre, as of a third person, the Occasion of that was, That when these Notes, and some about particular Qualities, were written, I had a Design to make two distinct sorts of Annotations upon that Essay; in the *former* whereof (which now comes forth) I assumed the person of a Corpuscularian, and discours'd

The Author to the Reader!

at that rate: But I had thoughts too (in case God were pleas'd to grant me Life and Opportunity,) to take a *second* Review both of the Treatise it self, and of the Notes on it, and on that occasion to Adde what my riper Thoughts and further Experience might suggest unto me. And that in my Animadversions I might, with the more Freedome and Conveniency, Adde, Explain, Alter, and even Retract, as I should see cause, I thought it not amiss to write them, as if they were made on the VVork of another. By which Intimation the Reader may be assisted to guess how much I intended in the following Discourse, (in which, as in the Prefaces belonging to it, I play the Corpuscularian,) to reserve my self the Freedom of Questioning, and Correcting, upon the design'd Review, any thing deliver'd in these Notes; and how much more it was in them my design to bring *Pyrophilus* Experiments and Queries to Illustrate obscure matters, then, by hasty Assertions, to Dogmatize about them.

THE



The Præface.

THe Origine (Pyrophilus) and Nature of the Qualities of Bodies, is a Subject, that I have long lookt upon, as one of the most Important and Usefull that the Naturalist can pitch upon for his Contemplation. For the Knowledge we have of the Bodies without Us, being for the Most part fetched from the Informations the Mind receives by the Senses, we scarce know any thing else in Bodies, upon whose account they can worke upon our Senses save their Qualities: For as to the Substantial Formes, which some Imagine to be in all Naturall Bodies, it is not halfe so Evident, that there are such, as it is, that the wisest of those that do admit them, Confesse, that they do not well Know them. * And as tis by their Qualities, that Bodies act Immediately upon our

*Nego tibi ullam esse formam nobis notam plenè & plenè: nostramque scientiam esse umbram in sole. Scaliger : (of whose confession to the same purpose, more are cited hereafter.)

B

Senses,

The Preface.

Senses, so 'tis by vertue of those Attributes likewise, that they act upon Other bodies, & by that action produce in Them, & oftentimes in Themselves those Changes, that sometimes we call Alterations, and sometimes Generation, or Corruption.

And 'tis chiefly by the Knowledge, such as it is, that Experience, (not Art) hath taught Us, of these differing Qualities of Bodies, that we are enabled, by a due application of Agents to Patients, to exercise the little Empire, that we have either Acquir'd or Regain'd over the Creatures. But I think not the contemplation of Qualities more Noble & Useful, then I find it Difficult; For what is wont to be taught us of Qualities in the Schools, is so Slight and ill grounded, that it may be doubted, whether they have not rather Obscured, then Illustrated the things they should have explain'd. And I was quickly discouraged from expecting to learne much from them, of the Nature of divers Particular Qualities, when I found, that except some few, which they tell You in
general

The Preface.

General may be deduced, (by wayes they leave those to guesse at that can,) from those foure Qualities, they are pleas'd to call the First; they confesse, that the rest spring from those Forms of Bodies, whose particular Natures, the judiciousest of them acknowledge, they cannot comprehend. And Aristotle himself not only doth (as we shall see anon) give us of Qualitie in Generall, (which yet seems far more easily defineable, then many a Particular Quality,) no other then such a definition, as is as Obscure, as the thing to be declared by it; but I Observe not without some wonder, that in his eight Books of Physicks, where he professedly treats of the Generall Affections of Naturall things, he leaves out the Doctrine of Qualities; as after him Magirus, and divers other Writers of the Peripatetick Physiologie have done: which (by the way) I cannot but look upon as an Omission, since Qualities doe as well seem to belong to Naturall Bodies Generally consider'd, as Place, Time, Motion, and those other things, which upon that

The Præface.

account are wont to be Treated of in the Generall part of Natural Philosophy. The most Ingenious Des Cartes has something concerning some Qualities; but though for Reasons elsewhere express'd, I have purposely Forborn to peruse his Systeme of Philosophy; yet I find by Turning over the Leaves that he has Left most of the other Qualities Untreated of, & of Those, that are more properly call'd Sensible, he Speaks but very Briefly & Generally; rather considering what they do upon the Organs of Sense, then what Changes happen in the Objects themselves, to make them Cause in us a Perception sometimes of one Quality, and sometimes of Another. Besides, that his Explications, do many of them so depend upon His peculiar Notions, (of a *Materia Subtilis*, *Globuli Secundi Elementi*, and the like) and These, as it became so Great a Person, he has so Intermoven with the rest of his Hypothesis, that They can seldome be made Use of, without Adopting his whole Philosophy. Epicurus indeed, and his Scholiast Lucretius

tius

The Præface.

tius, have Given some good Hints concerning the Nature of some few Qualities. But beside, that even these Explications are divers of them either Doubtfull or Imperfect, or both, there are many other Qualities, which are left for Others to Treat of. And this is the Second and Main Difficul-ty, which I find in investigating the Nature of Qualities, Namely, that Whatever be to be thought of the Generall Theories of Aristotle, or other Philosophers, concerning Qualities, we evidently Want That, upon which a Theory, to be Solid and Usefull, must be Built; I mean an Experimentall History of them. And this we so Want, that except perhaps what Mathematicians have done concerning Sounds, and the Observations (rather then Experiments) that our Illustrious Verulam hath (in some few Pages) say'd of Heat, in his short Essay, De Formâ Calidi; I know not Any one Quality, of which any Author has yet Given us an any thing competent History. These things I mention to You, Pyrophilus, not

The Preface.

at all to derogate from those Great Men; whose design seems rather to have been to deliver Principles and Summaries of Philosophy, then to insist upon Particulars; but for this purpose, that since the Nature of Qualities is so beneficiall a speculation, my labours may not be look'd upon as wholly Uselesse, though I can contribute but a little to the clearing of it: and that since 'tis so abstruse a subject, I may be pardon'd, if I sometimes misse the marke, and leave diverse things uncompleated; That being but what such great Philosophers have done before mee.

But, Pyrophylus, before I proceed to give You my Notes upon this part of our Author's Essay, that you may rightly understand my Intention in them, it will be requisite to give you three or foure Advertisements.

And first, when ever I shall speake indefinitely of Substantiall forms, I would alwayes be understood to except the Reasonable Soule, that is said to inform the humane Body; which Declaration I here desire may be
taken

The Preface.

taken notice of, once for all.

Secondly, Nor am I willing to treat of the Origine of Qualities in beasts; partly because I would not be engaged to examine, of what Nature their Soules are, and partly because it is difficult in most cases, (at least for one, that is compassionate enough,) either to make experiments upon Living animals, or to judg what influence their Life may have, upon the change of Qualities, produc'd by such Experiments.

Thirdly, The occasion of the following Reflections, being onely this; that our Author in that part of his Essay concerning Salt-peter, whereto these Notes referre, does briefly Intimate some Notions about the Nature and Origine of Qualities; You must not expect, that I, whose Method leads me but to Write some Notes upon this, and some other parts of this Essay, should make Solemne or Elaborate discourses concerning the Nature of particular Qualities, and that I should fully deliver my own apprehensions concerning those

The Præface.

Subjects. For as I elsewhere sufficiently Intimate, that in these first Notes I Write as a Corpuscularian, & set down those Things onely, that seem to have a tendency to Illustrate or Countenance the Notions or Fancies imply'd in our Author's Essay: So I must here Tell you, that I neither have now the Leasure, nor Pretend to the Skill, to deliver Fully the History, or to Explicate Particularly the Nature of Each severall Quality.

Fourthly, But I consider, that the Schools have of late much Amus'd the World, with a way they have got, of Referring all Natural Effects to certain Entities, that they call Reall Qualities, and accordingly Attribute to them a Nature distinct from the Modification of the Matter they belong to, & in some cases Separable from all Matter whatsoever, by which Meanes they have, as farre forth as their Doctrine is Acquiesc'd in, made it thought Needlesse or Hopeless for men to Employ their Industry, in searching into the Nature of Particular Qualities, & their Effects. As if, (for instance) it be Demanded,

The Præface

manded, how Snow comes to dazle the Eyes, they will answer, that 'tis by a Quality of Whiteness that is in It; which makes all very white Bodies produce the same Effect; And if You, ask what this Whiteness is, They will tell you no more in substance, then that tis a real Entity, which denominates the Parcel of Matter, to which it is Joyn'd, White; & if You further Enquire, what this real Entity, which They call a Quality, is, You will find, as Wee shall see anon, that They either Speak of it much after the same rate, that They do of their Substantiall Forms; (as indeed some of the Modern'st teach, That a Quality affects the Matter it belongs to, per modum formæ secundariæ, as they speak) or at least they will not Explicate it more Intelligibly.

And accordingly if you further Ask them, how white Bodies in Generall do rather Produce this effect of dazling the Eyes, then Green or Blew ones, instead of being told, that the former sort of Bodies reflect Outwards, and so to the Eye farre more of the Incident Light, then the Latter; You shall perchance
be

The Preface.

be told, that 'tis their respective Natures so to act, by which way of dispatching difficulties, they make it very easy to solve All the Phenomena of Nature in Generall, but make men think it impossible to explicate almost Any of them in Particular.

And though the Unsatisfactorisness and Barrenesse of the School-Philosophy have perswaded a great many Learned Men, especially Physicians, to substitute the Chymists Three principles, instead of those of the Schools; and though I have a very good opinion of Chymistry it self, as 'tis a Practicall Art; yet as 'tis by Chymists pretended to containe a Systeme of Theoricall Principles of Philosophy, I fear it will afford but very little satisfaction to a severe enquirer, into the Nature of Qualities. For besides that, as we shall more particularly see anon, there are Many Qualities, which cannot with any probability be deduc'd from Any of the three Principles; those that are ascrib'd to One, or other of them, cannot Intelligibly be explicated,

The Preface.

ted, without recourse to the more Comprehensive Principles of the Corpuscularian Philosophy. To tell us, for instance, that all Solidity proceeds from Salt, onely informing us, (where it can plausibly be pretended) in what materiall principle or ingredient that Quality resides, not how it is produced; for this doth not teach us, (for example) how Water even in exactly clos'd vessels comes to be frozen into Ice; that is, turn'd from a fluid to a Solid Body, without the accession of a saline ingredient (which I have not yet found pretended, especially Glasse being held Impervious to Salts.) Wherefore, Pyrophilus, I thought it might much conduce to the understanding the Nature of Qualities, To shew how they are Generated; and by the same way, I hop'd it might remove in some measure the obstacle, that these Dark and Narrow Theories of the Peripateticks and Chymists may prove to the Advancement of solid and usefull Philosophy. That then, which I chiefly aim at, is to make it Probable to you by Experiments,

The Præface.

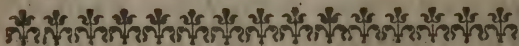
*Experiments, (which I Think hath not yet
beeene done:) That almost all sorts of
Qualities, most of which have been by
the Schooles either left Unexplicated, or Ge-
nerally referr'd, to I know not what In-
comprehensible Substantiall Formes; may
be produced Mechanically, I mean by
such Corporeall Agents, as do not appear,
either to Work otherwise, then by vertue of
the Motion, Size, Figure, and Contrivance
of their own Parts, (which Attributes I
call the Mechanicall Affections of Mat-
ter, because to Them men willingly Referre
the various Operations of Mechanical En-
gines:) or to Produce the new Qualities
exhibited by those Bodies their Action
changes, by any other way, then by chan-
ging the Texture, or Motion, or some other
Mechanical Affection of the Body wrought
upon. And this if I can in any Passable mea-
sure do, though but in a generall way, in some
or other of each of these Three Sorts, into
which the Peripateticks are wont to Divide
the Qualities of Bodies, I hope I shall have
done*

The Præface.

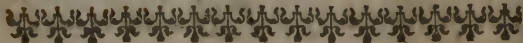
done no uselesse Piece of Service to Natural Philosophy, Partly by exciting You, and Your Learned Friends, to Enquire after more Intelligible and Satisfactory wayes of explicating Qualities, and Partly by Beginning such a Collection of Materials towards the History of those Qualities, that I shall the most largely Insist on, as Heat, Colours, Fluidity and Firmnesse, as may invite You, and other Ingenious men, to contribute also their Experiments, and Observations to so Usefull a VVork, and thereby lay a foundation, whereon You, and perhaps I, may superstruct a more Distinct and Explicite Theory of Qualities, then I shall at present adventure at. And though I Know, that some of the things my Experiments tend to Manifest, may likewise be Confirm'd by the more obvious Phenomena of Nature, yet I Præsume You will not dislike my Choosing to entertaine You with the Former, (though without at all Despiſing, or so much as strictly forbearing to Employ the Latter,) because the Changes of Qualities made by
our

The Preface.

Our Experiments will for the most part be more Quick & Conspicuous, and the agents made use of to produce them, being of our own Applying, and oftentimes of our own Preparation, we may be thereby assisted the better to judge of what they Are, and to make an estimate of what 'tis they Do.



CONSIDER-



(1)



CONSIDERATIONS,

AND

EXPERIMENTS

touching

the Origine of Qualities, and Forms.

The Theoricall Part.



Hat before I descend to Particulars, I may (*Pyrophilus*) furnish you with some General Apprehension of the Doctrine (or rather the *Hypothesis*,) which is to be Collated *with*, and to be either Confirmed, or Disproved by, the Historicall Truths, that will be deliver'd concerning Particular Qualities, (& Forms;) I will assume the person of a Corpuscularian,

rian, and here, at the Entrance, give you (in a general way) a brief Account of the *Hypothesis* it selfe, as it concernes the Origine of Qualities (and Forms:) and for Distinctions sake, I shall comprize it in the Eight following Particulars, which, that the whole Scheme may be the better Comprehended, and as it were Survey'd under one Prospect, I shall do little more then Barely propose *Them*, that either seem evident enough by their owne Light, or may without Præjudice have diverse of their Proofes reserv'd for proper places in the following part of this Treatise: and though there be some *other* Particulars, to which the Importance of the Subjects, and the Greatnesse of the (almost Universall) Prejudices, that lye against them, vwill oblige mee Immediately to annexe (for the seasonable Clearing, and Justifying of them) some Annotations: yet that they may, as Little as I can, Obscure the Cohærence of the vvhole Discourse, as
much

much of them as conveniently may be, shall be included in [] Paratheses.

I. I agree with the generality of Philosophers so far, as to allow, that there is one Catholick or Universal Matter common to all Bodies, by which I mean a Substance extended, divisible and impenetrable.

II. But because this Matter being in its own Nature but one, the diversity we see in Bodies must necessarily arise from somewhat else, then the Matter they consist of. And since we see not, how there could be any change in Matter, if all its (actual or designable) parts were perpetually at rest among themselves, it will follow, that to discriminate the Catholick Matter into variety of Natural Bodies, it must have Motion in some or all its designable Parts: and that Motion must have various tendencies, that which is in this part of the Matter tending one way, and that which is in that part tending another,

C

as

as we plainly see in the Universe or general Mass of Matter there is really a great quantity of Motion, and that variously determin'd, and that yet diverse portions of Matter are at rest.

That there is Local Motion in many parts of Matter is manifest to sense, but how Matter came by this Motion was of Old, and is still hotly disputed of: for the antient Corpuscularian Philosophers, (whose doctrine in most other points, though not in all, we are the most inclinable to,) not acknowledging an Author of the Universe, were thereby reduc'd to make Motion congenite to Matter, and consequently coëval with it; but since Local Motion, or an Endeavour at it, is not included in the nature of Matter, which is as much Matter, when it rests, as when it moves; and since we see, that the same portion of Matter may from Motion be reduc'd to Rest, and after it hath continu'd at Rest, as long as other Bodies doe not put it out
of

of that state, may by external Agents be set a moving again; I, who am not wont to think a man the worse Naturalist for not being an Atheist, shall not scruple to say with an Eminent Philosopher of Old, whom I find to have propos'd among the Greeks that Opinion (for the main) that the Excellent *Des Cartes* hath revived amongst Us, That the Origine of Motion in Matter is from God; and not onely so, but that thinking it very unfit to be believ'd, that Matter barely put into Motion, and then left to it self, should Casually constitute this beautiful and orderly World: I think also further, that the wise Author of Things did by establishing the laws of Motion among Bodies, and by guiding the first Motions of the small parts of Matter, bring them to convene after the manner requisite to compose the World, and especially did contrive those curious and elaborate Engines, the bodies of living Creatures,

ttires, endowing most of them with a power of propagating their Species. But though these things are my Perswasions, yet because they are not necessary to be supposed here, where I doe not pretend to deliver any compleat Discourse of the Principles of Natural Philosophy; but onely to touch upon such Notions, as are requisite to explicate the Origine of Qualities and Forms, I shall pass on to what remains, as soon as I have taken notice, that *Local Motion seems to be indeed the Principle amongst Second Causes, and the Grand Agent of all that happens in Nature*: For though Bulk, Figure, Rest, Situation, and Texture do concur to the *Phænomena* of Nature, yet in comparison of Motion they seem to be in many Cases, Effects, and in many others, little better then *Conditions*, or *Requisites*, or *Causes sine quibus non*, which modifie the operation, that one part of Matter by vertue of its Motion hath upon another,

nother: as in a Watch, the number, the figure, and coaptation of the Wheels and other parts is requisite to the shewing the hour, and doing the other things that may be perform'd by the Watch; but till these parts be actually put into Motion, all their other affections remaine inefficacious: and so in a Key, though if it were too big, or too little, or if its Shape were incongruous to that of the cavity of the Lock, it would be unfit to be us'd as a Key, though it were put into Motion; yet let its bigness and figure be never so fit, unless actual Motion intervene, it will never lock or unlock any thing, as without the like actual Motion, neither a Knife nor Rasor will actually cut, how much soever their shape & other Qualities may fit them to do so. And so Brimstone, what disposition of Parts soever it have to be turn'd into Flame, would never be kindled, unless some actual fire, or other parcel of vehemently and variously agitated

Matter should put the Sulphureous Corpuscles into a very brisk motion.

III. These two grand and most Catholick Principles of Bodies, Matter, and Motion, being thus establish'd, it will follow both, that Matter must be actually divided into Parts, that being the genuine Effect of variously determin'd Motion, and that each of the primitive Fragments, or other distinct and entire Masses of Matter must have two Attributes, its own Magnitude, or rather *Size*, and its own *Figure* or *Shape*. And since Experience shews us (especially that which is afforded us by Chymical Operations, in many of which Matter is divided into Parts, too small to be singly sensible,) that this division of Matter is frequently made into insensible Corpuscles or Particles, we may conclude, that the minutest fragments, as well as the biggest Masses of the Universal Matter are likewise endowed each with its peculiar Bulk and Shape.

Shape. For being a finite Body, its Dimensions must be terminated and measurable: and though it may change its Figure, yet for the same reason it must necessarily have *some Figure* or other. So that now we have found out, and must admit three Essential Properties of each entire or undivided, though insensible part of Matter, namely, *Magnitude*, (by which I mean not quantity in general, but a determin'd quantity, which we in English oftentimes call the *Size* of a bodie,) *Shape*, and either *Motion* or *Rest*, (for betwixt them two there is no mean:) the two first of which may be called *inseparable Accidents* of each distinct part of Matter: *inseparable*, because being extended, and yet finite, it is Physically impossible, that it should be devoid of some Bulk or other, and som determinate Shape or other; and yet *Accidents*, because that whether or no the Shape can by Physical Agents be alter'd or the Body subdivided,

vided, yet mentally both the one and the other may be done, the whole essence of Matter remaining undestroy'd.

Whether these Accidents may not conveniently enough be call'd the Moods or primary affections of Bodies, to distinguish them from those lesse simple Qualities, (as Colours, Tastes, and Odours,) that belong to Bodies upon their account, or whether with the Epicureans they may not be called the Conjuncts of the smallest parts of Matter, I shall not now stay to consider, but one thing the Modern Schools are wont to teach concerning Accidents, which is too repugnant to our present Doctrine, to be in this place quite omitted, namely that there are in Natural Bodies store of *real Qualities*, and other *real Accidents*, which not onely are no Moods of Matter, but are real Entities distinct from it, and according to the doctrine of many modern Schoolmen may *exist separate* from all
Matter

Matter whatsoever. To clear this point a little, we must take notice, that *Accident* is among Logicians and Philosophers us'd in two several senses, for sometimes it is oppos'd to the 4th Prædicable, (*Property*,) and is then defin'd, "that which may be present or absent, without the destruction of the subject; as a Man may be sick or well, and a Wall white or not white, and yet the one be still a Man, the other a Wall; and this is call'd in the Schools *Accidens prædicabile*, to distinguish it from what they call *Accidens prædicamentale*, which is oppos'd to Substance: for when things are divided by Logicians into 10 Prædicaments, or highest genus'es of things, Substance making one of them, all the nine other are of Accidents. And as Substance is commonly defin'd to be a thing that subsists of it self, and is the subject of Accidents, (or more plainly, a real Entity or thing, that needs not any (*created*) Being, that it may exist:)

so

so an Accident is said commonly to be *id cuius esse est inesse*, and therefore Aristotle, who usually calls Substances simply ὀντα, Entities, most commonly calls Accidents ὀντῶ ὀντα, Entities of Entities. These needing the existence of some substance or other, in which they may be, as in their subject of Inhæ-
 sion. And because Logicians make it the discriminating note of Substance, and Accident, that the former is a thing that cannot be in another, as in its subject of Inhæ-
 sion, tis requisite to know, that according to them, That is said to *Be in a Subject*, which hath these three conditions; That however it (1) *be in another thing*, (2) *is not in it as a part*, and (3) *cannot exist separately* from the thing or subject, wherein it is: as a white Wall is the subject of Inhæ-
 sion of the Whiteness we see in it, which self-same whiteness, though it be not in the wall as a part of it, yet cannot the self-same whiteness according to our Logi-
 cians

cians exist any where out of the wall; though many other Bodies may have the like degree of whiteness. This premis'd, twill not be hard to discover the falsity of the lately mentioned Scholastic opinion touching real Qualities and Accidents, their doctrine about which does, I confess, appear to me to be either unintelligible, or manifestly contradictory: for speaking in a Physical sense, if they will not allow these Accidents to be Modes of Matter, but Entities really distinct from it, and in some cases separable from all Matter, they make them indeed Accidents in name, but represent them under such a notion as belongs onely to Substances; the nature of a Substance consisting in this, That it can subsist of it selte, without being in any thing else, as in a subject of Inhæssion: so that to tell us, that a Quality, or other Accident may subsist without a subject, is indeed, whatever they please to call it, to allow it the
true

true Nature of Substance, nor will their Groundlesse Distinctions do any more then keep them from seeming to contradict themselves in words, whilst Unprepossess'd persons see that they do it in effect. Nor could I ever find it intelligibly made out, what these real Qualities may be, that they deny to be either Matter or modes of Matter, or immaterial Substances. When a Bowl runs along or lies still, that *Motion* or *Rest*, or *Globous figure* of the Bowl, is not *Nothing*, and yet it is not any *part* of the Bowl; whose whole Substance would remain, though it wanted which you please of these Accidents: and to make them *real* and *physical* Entities, (for we have not here to do either with *Logical* or *Metaphysical* ones) is, as if, because we may consider the same Man sitting, standing, running, thirsty, hungry, wearie, &c. we should make each of these a distinct Entitie, as we do give some of them (as hunger, weariness, &c.) distinct

distinct names. Whereas the Subject of all these Qualities is but the same Man as he is considered with Circumstances, that make him appear different in one case from what he appears in another: And it may be very useful to our present Scope to observe, that not onely diversity of *Names*, but even diversity of *Definitions*, doth not alwaies infer a diversity of *Physical Entities* in the Subject, whereunto they are attributed. For it happens in many of the Physical Attributes of a Body, as in those Other cases, wherein a Man that is a Father, a Husband, a Master, a Prince, &c. may have a Peculiar Definition (such as the Nature of the thing will bear) belong unto him in each of these Capacities, and yet the Man in himself considered is but the same Man, who in respect of differing Capacities or Relations to other things is call'd by differing Names, and describ'd by various Definitions, which yet (as I was saying)

saying) conclude not so many real and distinct Entities in the person so variously denominated.

An
EXCURSION
about the Relative Nature of Physical Qualities.

BUT because I take this Notion to be of no Small Importance towards the Avoiding of the Grand Mistake, that hath hitherto obtain'd about the Nature of Qualities, it will be worth while to Illustrate it a little farther. We may consider then, that when *Tubal-Cain*, or whoever else were the Smith, that Invented *Locks* and *Keyes*, had made his first Lock, (for we may Reasonably suppose him to have made that before the *Key*, though the Comparison

parison may be made use of without that Supposition,) That was onely a Piece of Iron, contriv'd into such a Shape; and when afterwards he made a Key to that Lock, That also in it self Consider'd, was nothing but a Piece of Iron of such a Determinate Figure: but in Regard that these two Pieces of Iron might now be Applied to one another after a Certain manner, and that there was a Congruitie betwixt the Wards of the Lock and those of the Key, the Lock and the Key did each of them now Obtain a new Capacity, and it became a Main part of the Notion and Description of a Lock, that it was capable of being made to Lock or Unlock by that other Piece of Iron we call a Key, and it was Lookd upon as a Peculiar Faculty and Power in the Key, that it was Fitted to Open and Shut the Lock, and yet by these new Attributes there was not added any Real or Physical Entity, either to the Lock, or to the Key,

Key, each of them remaining indeed nothing, but the same Piece of Iron, just so Shap'd as it was before. And when our Smith made other Keyes of differing Bignesses, or with Differing Wards, though the first Lock was not to be open'd by any of those Keyes, yet that Indisposition, however it might be Consider'd as a peculiar Power of Resisting this or that Key, and might serve to Discriminate it sufficiently from the Locks those Keyes belong'd to, was nothing new in the Lock, or distinct from the Figure it had before those Keyes were made. To carrie this Comparison a little Further, let me adde, that though one that would have Defin'd the First Lock, and the First Key, would have Given them distinct Definitions with Reference to each other; and yet (as I was saying) these Definitions being given but upon the Score of Certain Respects, which the Defin'd Bodies had One to Another, would not
infer,

infer, that these two Iron Instruments did Physically differ otherwise then in the Figure, Size, or Contrivement of the Iron, whereof each of them consisted. And proportionably hereunto I do not see, why we may not conceive, That as to those Qualities (for Instance) which we call Sensible, though by virtue of a certain Congruity or Incongruity in point of Figure or Texture, (or other Mechanical Attributes,) to our Sensories, the Portions of Matter they Modifie are enabled to produce various Effects, upon whose account we make Bodies to be Endow'd with Qualities; yet They are not in the Bodies that are Endow'd with them any Real or Distinct Entities, or differing from the Matter its self, furnish'd with such a Determinate Bigness, Shape, or other Mechanical Modifications. Thus though the modern Gold-Smiths and Refiners reckon amongst the most distinguishing Qualities of Gold, by which

D

men

men may be certain of its being True, and not Sophisticated, that is easily dissoluble in *Aqua Regis*, and that *Aqua Fortis* will not work upon it; yet these Attributes are not in the Gold any thing distinct from its peculiar Texture, nor is the Gold we have now of any other Nature, then it was in *Pliny's* time, when *Aqua Fortis* and *Aqua Regis* had not been Found out, (at least in these parts of the World,) and were utterly unknown to the Roman Gold-Smiths. And this Example I have the rather pitch'd upon, because it affords me an Opportunity to represent, that, unless we admit the Doctrine I have been Proposing, we must Admit, that a Body may have an almost Infinite Number of New Real Entities accruing to it, without the Intervention of any Physical Change in the Body its self. As for Example, Gold was the same Natural Body immediately before *Aqua Regis* and *Aqua Fortis* were first made, as it was

was immediately after, and yet now 'tis reckon'd amongst its Principal Properties, that it is dissoluble by the Former of those two Menstruums, and that it is not like other Mettals Dissoluble or Corrodible by the Latter. And if one should Invent another Menstruum, (as possibly I may Think my self Master of such a one) that will but in part dissolve pure Gold, and change some part of it into another Metalline Body, there will then arise another new Property, whereby to distinguish That from other Mettals; and yet the Nature of Gold is not a whit other now, then it was before this last Menstruum was first made. There are some Bodies not Cathartick, nor Sudorifick, with some of which Gold being joyn'd acquires a Purgative Vertue, and with others a power to procure Sweat; and in a word, Nature her self doth, sometimes otherwise, and sometimes by Chance, produce so many things, that have new Relations unto others:

thers: And Art, especially assisted by Chymistry, may, by variously dissipating Natural Bodies, or Compound-
ing either them, or their Constituent Parts with one another, make such an Innumerable Company of new Productions, that will each of Them have new operations, either immediately upon our Sensories, or upon other Bodies, whose Changes we are able to perceive, that no man can know, but that the most Familiar Bodies may have Multitudes of Qualities, that he dreams not of, and a Considering man will hardly imagine, that so numerous a Croud of real Physical Entities can accrue to a Body, whilst in the Judgment of all our Senses it remains Unchang'd, and the Same that 'twas before.

To clear this a little farther, we may adde, that beaten Glass is commonly reckon'd among Poisons; and (to skip what is mention'd out of *Sanctorius*, of the Dysentery procur'd by the Fragments

ments of it) I remember **Cardan* hath a story, That in a Cloister, where he had a Patient then like to die of torments in the Stomach, two other Nuns had been already kill'd by a distracted Woman, that having Casually got Free, had mixt beaten Glas with Pease, that were eaten by these three, and diverse others of the Sisters (who yet escap'd unharm'd.) Now though the powers of Poisons be not onely look'd upon as *real* Qualities, but are reckoned among the *Abstrusest* ones: yet this Deleterious Faculty, which is suppos'd to be a Peculiar and Superadded Entitie in the beaten Glasse, is really nothing distinct from the Glas its self, (which though a Concrete made up of those Innocent Ingredients, Salt and Ashes, is yet a hard and stiffe Body,) as it is furnish'd with that determinate Bigness, and Figure of Parts, which have been acquir'd

* *Cardan: Contradiet. 9. lib. 2. Tract. 5. apud Schenckium.*

by Comminution. For these Glassy Fragments being many, and Rigid, and somewhat Small, (without yet being so small as Dust,) and endow'd with sharp Points and cutting Edges, are enabled by these Mechanical Affections to Pierce or Wound the tender Membranes of the Stomach and Guts, and cut the slender Vessels that they meet with there, whereby naturally ensue great Gripings and Contorsions of the injur'd Parts, and oftentimes Bloody Fluxes occasion'd by the perforation of the Capillary Arteries, and the great irritation of the Expulsive Faculty, and sometimes also not onely horrid Convulsions by Consent of the Brain and Cerebellum, with some of the Nervous or Membranous parts that happen to be hurt, but also Dropsies occasioned by the great loss of Blood we were just now speaking of. And it agrees very well with this Conjecture, that beaten Glass hath diverse times been observ'd

to have done no Mischief to Animals that have swallowed it: For there is no Reason it should, in case the Corpuscles of the Powder either chance to be so small, as not to be fit to wound the Guts, which are usually lin'd with a slimy substance, wherein very minute Powders may be as it vvere sheath'd, and by that means hinder'd from hurting the Guts, (insomuch that a fragment of Glass vvith three very sharp corners, hath been observ'd to have for above eighteen Months lain * inoffensive even in a nervous and very sensible part of the body,) out of vvhich they may with the grosser Excrements of the Lower Belly be harmelesly Excluded,

* This memorable Accident happen'd to a Senator of Berne, who was cur'd by the Experienc'd *Fabricius Hildanus*, that gives a long Account of it to the Learned *Horstius*, among whose Observations tis extant: (*Lib. 2. observ. 35.*) who ascribes the Indolence of the Part, whilst uncompress'd, to some slimy Juice, (familiar enough to those Tendinous parts,) wherein the Glassy fragment was as it were Bedded.

especially in some Individuals, whose
 Guts and Stomach too may be of a
 much stronger Texture, and better
 Lin'd or Stuff'd with Gross and Slimy
 Matter, then those of others. And ac-
 cordingly we see, that the Fragments
 of Saphires, Christsals, and ev'n Rubies,
 which are much harder then Glass, are
 innocently, though perhaps not very
 effectually us'd by Physicians, (and I
 have several times taken That without
 Inconvenience) in Cordial Compositi-
 ons, because of their being by Grinding
 reduc'd to a Powder too Subtle to Ex-
 coriate, or Grate upon the Stomach, or
 Guts; and probably 'twas upon some
 such Account, that That happen'd
 which is related by *Eardan* in the same
 place, namely, That though the three
 Nuns we have been speaking of were
 Poison'd by the Glass, yet many others
 who eat of the other Portions of the
 same mingled Pease, receiv'd no mis-
 chief thereby. (But of this subject
 more

more † elsewhere.)

And this puts me in mind to adde,
That the Multiplicity of Qualities, that
are sometimes to be met with in the
same Natural Bodies, needs not make
men reject the Opinion we have been
proposing, by perswading them, that
so many Differing Attributes, as may
be sometimes found in one and the same
Natural Body, cannot proceed from
the bare Texture, and other Mechan-
ical Affections of its Matter. For we
must consider each Body, not barely as
it is in it self an entire and distinct por-
tion of Matter, but as it is a Part of the
Universe, and consequently plac'd a-
mong a great Number and Variety of
other Bodies, upon which it may Act,
and by which it may be acted on, in ma-
ny waies, (or upon many Accounts,)
each of which Men are wont to Fancy,

† In those Notes about Occult Qualities, where the
Deleterious Faculty attributed to Diamonds is consid-
ered.

as a distinct Power or Quality in the Body, by which those Actions, or in which those Passions are produc'd. For if we thus consider Things, we shall not much wonder, that a Portion of Matter, that is indeed endow'd but with a very few Mechanical Affections, as such a determinate Texture and Motion, but is plac'd among a multitude of other Bodies, that differ in those Attributes from it, and one another, should be capable of having a great Number and Variety of Relations to those other Bodies, and consequently should be thought to have many Distinct Inherent Qualities, by such as look upon those several Relations or Respects it may have to Bodies without it, as Real and Distinct Entities implanted in the Body it self. When a Curious Watch is going, though the Spring be that which puts all the Parts into Motion, yet we do not Fancie (as an *Indian* or *Chinois* would perchance do) in this
 Spring

Spring one Faculty to move the Index uniformly round the Dial-plate, another to strike the Hour, and perhaps a Third to give an Alarme, or shew the Age of the Moon, or the Tides; all the action of the Spring, (which is but a flexible piece of Steel, forcibly coil'd together,) being but an Endeavour to dilate or unbind its self, and the rest being perform'd by the various Respects it hath to the several Bodies (that compose the Watch) among which it is plac'd, and which they have One to another. We all know, that the Sun hath a power to Harden Ciay, and Soften Wax, and Melt Butter, and Thaw Ice, and turn Water into Vapours, and make Air expand it self in Weather-Glasses, and contribute to Blanch Linnen, and make the White skin of the Face Swarthy, and Mowed Grass Yellow, and ripen Fruit, hatch the Eggs of Silk-worms, Caterpillars, and the like Insects, and perform I know not how many

many other things, divers of which seem contrary Effects, and yet these are not distinct Powers or Faculties in the Sun, but onely the Productions of its Heat, (which it self is but the brisk, and confus'd Local Motion of the Minute parts of a Body,) diversify'd by the differing Textures of the Body that it chances to work upon, and the Condition of the other Bodies that are concern'd in the Operation. And therefore whether the Sun in some cases have any Influence at all distinct from its Light and Heat, we see, that all those *Phænomena* we have thought fit to name are producible by the heat of the common Culinary Fire duly apply'd and regulated. And so, to give an *Instance* of another Kind, when some years since, to Try some Experiments about the Propagation of Motion, with Bodies less capable of being batter'd by one another, then those that have been formerly employ'd; I caus'd some solid Bals of Iron

skil-

skilfully harden'd , and exquisitely shap'd and glaz'd , to be purposely made; each of these polished Balls was a Sphærical Looking-Glass, which plac'd in the mid'st of a Room, would exhibit the Images of the Objects round about it, in a very regular and pleasing Perspective. It would Contract the Image, and Reflect the Beams of the Sun, after a manner differing from Flat and from Convex Looking Glasses. It would in a neat Perspective lessen the Image of him that look'd upon it; and bend it, and it would shew that Image, as if it were behind the Surface, and within the solid substance of the Sphære, and in some it had all those Distinct, and some of them wonderful Properties , which either Antient or Modern Writers of Catoptricks have demonstrated to belong to Sphærical *Specula*, as such: and yet the Globe furnish'd with all these Properties and Affections, was but the Iron it self reduc'd by the Artificer to

a Sphærical Figure, (for the Glass, that made it Specular, was not distinct from the Superficial parts of the Iron, reduc'd all of them to a Physically equal distance from the Center.) And of *specula*, Sphærical enough as to sense, you may make store in a trice, by breaking a large Drop of Quick-silver into several little ones, each of which will serve for Objects plac'd pretty near it, and the smaller of which (being the least depress'd in the middle by their own weight, and consequently more perfectly Globous,) may with a good Microscope plac'd in a Window afford you no unpleasant prospect of the neighbouring Objects, and yet to reduce a parcel of Stagnant Quicksilver, which will much æmulate a Flat Looking-Glass, into many of these little Sphærical *Specula*, whose Properties are so differing from those of Plain ones, there intervenes nothing but a sleight Local Motion, which in the twinckling of an
 Eye

Eye changeth the Figure of the self
same Matter.

I have said thus much (*Pyrophilus*) to
remove the Mistake, That *every thing*
men are wont to call a Quality, must
needs be a Real and Physical Entity,
because of the Importance of the Sub-
ject; and yet I have omitted some things
that might have been pertinently added,
partly because I may hereafter have
Opportunity to take them in, and part-
ly because I would not any farther
lengthen this Excursion, which yet I
must not Conclude, till I have added
this short Advertisement.

That I have chosen to Declare what
I mean by Qualities, rather by Exam-
ples, then Definitions, *partly* because
being immediately or reductively the
Objects of sense, Men generally under-
stand pretty well what one another
mean, when they are spoken of: (As to
say, that the Taste of such a thing is Sa-
line or Sour, or that such a Sound is
Melo-

Melodious, Shrill, or Jarring, (especially if when we speak of Sensible Qualities, we adde some Enumeration of particular Subjects, wherein they do the most Eminently reside,) will make a Man as soon understood, as if he should go about to give Logical Definitions of those Qualities:) and partly because the Notions of things are not yet so well stated, and agreed on, but that it is many times difficult to Assign their true *Genus's*: and Aristotle himself doth not onely define *Accidents* without setting down their *Genus*, but when he comes to define *Qualities*, he tels us, that *Quality is that by which a thing is said to be Qualis*, where I would have you take notice both, that in his Definition he omits the *Genus*, and that 'tis no such easy Thing to give a very good Definition of Qualities, since he that is reputed the great Master of Logick, where he pretends to give us one, doth but upon the matter define the thing by the same thing,

thing; for 'tis suppos'd to be as little known what *Qualis* is, as what *Qualitas* is, and me thinks he does just as if I should define Whiteness to be that, for which a thing is called White; or Vertue, that for which a Man is said to be Vertuous †. Besides that, I much

† Since the writing of this, the Author found, that some of the Eminentest of the modern Schoolmen themselves, have been, as well as he, unsatisfied with the Aristotelian Definition of Quality: concerning which (not to mention Revius, a Learned Protestant Annotator upon Suarez,) Ariaga says (*disp. 5. sect. 2. subf. 1.*) *Per hanc nihil explicatur; nam de hac querimus, quid sit esse qual, dices habere qualitatem; bonus Circulus: qualitas est id quo quis fit qualis, & esse qualem est habere Qualitatem.* And even the famous Jesuit Suarez, though he endeavours to excuse it, yet confesseth, that it leaves the proper Notion of Quality as obscure to us as before: (*Que d. finitio*, saith he; *licet ea ratione essentialis videatur, quod detur per habitudinem ad effectum formalem, quem omnis Forma essentialiter respicit, tamen quod ad nos spectat, æquè obscura nobis manet propria ratio Qualitatis.*) Suarez *Disputat. Metaphysic. 42.* But Hurtadus (in his Metaphysical Disputations) speaks more boldly, telling us roundly, that it is *Non tam Definitio, quam inanis quedam Nugatio*, which makes me the more wonder, that a famous Cartesian (whom I forbear to name) should content himself to give us such an Insignificant, or at least Superficial Definition of Quality.

E

doubt,

doubt, whether his Definition be not Untrue as well as Obscure, for to the Question, *Qualis res est?* Answer may be return'd out of *some*, if not *all* of the other *Pradicaments of Accidents*: which some of the Modern Logicians being aware of, they have endeavour'd to salve the matter with certain Cautions and Limitations, which however they may argue the Devisors to be ingenious, do, for ought I can discern, leave us still to seek for a right and intelligible Definition of Quality in general, though to give such a one be probably a much easier Task, then to define many Qualities, that may be nam'd in particular, as Saltness, Sowness, Green, Blew, and many others, which when we hear nam'd, every man knows what is meant by them, though no man (that I know of) hath been able to give accurate Definitions of them.

IV. And if we should conceive, that
all

all the rest of the Universe were annihilated, except any of these entire and undivided Corpuscles, (treated of in the 3^d Particular foregoing,) it is hard to say what could be attributed to it, besides Matter, Motion (or Rest,) Bulk, and Shape, (whence by the way you may take notice, that Bulk, though usually taken in a Comparative sense, is in our sense an absolute Thing, since a Body would have it, though there were no other in the World.) But now there being actually in the Universe great Multitudes of Corpuscles mingled among themselves, there arise in any distinct portion of Matter, which a number of them make up, two new Accidents or Events: the one doth more relate to each particular Corpuscle in reference to the (really or supposed) stable Bodies about it, namely its *Posture*; (whether Erected, Inclined, or Horizontal:) And, when two or more of such Bodies are plac'd one by

E 2 another,

another, the manner of their being so plac'd, as one besides another, or one behind another, may be call'd their *Order*; as I remember, *Aristotle* in his *Metaphysics*, *lib. 1. cap. 4.* recites this Example out of the antient *Corpuscularians*, That *A and N differ in Figure, and A N and N A in Order, Z and N in Scituation*: and indeed Posture and Order seem both of them reducible to Scituation. And when many *Corpuscles* do so convene together as to compose any distinct Body, as a Stone; or a Mettal, then from their other Accidents (or Modes,) and from these two last mention'd, there doth emerge a certain Disposition or Contrivance of Parts in the whole, which we may call the *Texture* of it.

V. And if we should conceive all the rest of the Universe to be annihilated, save one such Body, suppose a Mettal or a Stone, it were hard to shew, that there is Physically any thing more in it
then

then Matter, and the Accidents we have already named. But now we are to consider, that there are *de facto* in the world certain sensible and rational Beings, that we call Men, and the body of Man having several of its external parts, as the Eye, the Ear, &c. each of a distinct and peculiar Texture, whereby it is capable to receive Impressions from the Bodies about it, and upon that account it is call'd an Organ of Sense, we must consider, I say, that these Sensories may be wrought upon by the Figure, Shape, Motion, and Texture of Bodies without them, after several waies, some of those External Bodies being fitted to affect the Eye, others the Ear, others the Nostrils, &c. And to these Operations of the Objects on the Sensories, the Mind of Man, which upon the account of its Union with the Body perceives them, giveth distinct Names, calling the one Light or Colour, the other Sound, the other Odour,

&c. And because also each Organ of Sense, as the Eye, or the Palat, may be it self differinglly affected by External Objects, the Mind likewise gives the Objects of the same Sense distinct Appellations, calling one colour Green, the other Blew, and one tast Sweet, and another Bitter, &c. Whence Men have been induc'd to frame a long Catalogue of such Things as, for their relating to our Senses, we call Sensible Qualities; and because we have been conversant with them, before we had the use of Reason, and the Mind of Man is prone to conceive almost every Thing (nay even Privations, as Blindness, Death, &c.) under the notion of a true Entitie or Substance as it self is; we have been from our Infancy apt to imagine, that these Sensible Qualities are Real Beings, in the Objects they denominate, and have the faculty or power to work such and such things; as Gravity hath a power to stop the motion of a Bullet
 shot

shot upwards, and carry that solid Globe of Matter toward the Center of the Earth, whereas indeed (according to what we have largely shewn above) there is in the Body, to which these Sensible Qualities are attributed, nothing of Real and Physical, but the Size, Shape, and Motion, or Rest of its component Particles, together with that Texture of the whole, which results from their being so contriv'd as they are; nor is it necessary they should have in them any thing more, like to the Ideas they occasion in us, those Ideas being *either* the Effects of our Præjudices, or Inconsiderateness, *or* else to be fetcht from the Relation, that happens to be betwixt those Primary Accidents of the Sensible Object, and the peculiar Texture of the Organ it affects; as when a Pin, being run into my Finger, causeth pain, there is no distinct Quality in the Pin answerable to what I am apt to fancy Pain to be, but the Pin in it self is

only slender, stiff, and sharp; and by those qualities happens to make a Solution of Continuity in my Organ of Touching, upon which, by reason of the Fabrick of the Body, and the intimate Union of the Soul with it, there ariseth that troublesome kind of Perception; which we call Pain, and I shall anon more particularly shew, how much that depends upon the peculiar fabrick of the Body.

VI. But here I foresee a Difficulty, which being perhaps the chiefeſt, that we ſhall meet with againſt the Corpufcular Hypotheſis, it will deſerve to be, before we proceed any farther, taken notice of. And it is this, that, whereas we explicate Colours, Odours, and the like ſenſible Qualities by a *relation to our Senſes*, it ſeems evident, that they have an *absolute* Being irrelative to *Us*; for, Snow (for inſtance) would be white, and a glowing Coal would be hot, though there were no Man or any other
Animal

Animal in the World: and 'tis plain, that Bodies do not onely by their Qualities work upon *Our senses*, but upon *other*, and those, Inanimate *Bodies*; as the Coal will not onely heat or burn a *Man's hand* if he touch it, but would likewise heat Wax, (even so much as to melt it, and make it flow,) and thaw Ice into Water, though all the Men, and sensitive Beings in the World were annihilated. To clear this Difficulty, I have several things to represent, and,

1. I say not, that there are no other Accidents in Bodies then Colours, Oudours, and the like; for I have already taught, that there are simpler and more Primitive Affections of Matter, from which these Secondary Qualities, if I may so call them, do depend: and that the Operations of Bodies upon one another spring from the same, we shall see by and by.

2. Nor do I say, that all Qualities of Bodies are *directly Sensible*; but I observe,

serve, that when one Body works upon another, the knowledg we have of their Operation, proceeds, either from some sensible Quality, or some more Catholick affection of Matter, as Motion, Rest, or Texture, generated or destroy'd in one of them; for else it is hard to conceive, how we should come to discover what passes betwixt them.

3. We must not look upon every distinct Body, that works upon our Senses, as a bare lump of Matter of that bigness and outward shape, that it appears of; many of them having their parts curiously contriv'd, and most of them perhaps in motion too. Nor must we look upon the Universe that surrounds us, as upon a moveless and undistinguish'd Heap of Matter, but as upon a great Engine, which, having either no Vacuity, or none that is considerable, betwixt its parts (known to us,) the actions of particular Bodies upon one another must not be barely estimated,

mated, as if two Portions of Matter of their Bulk and Figure were plac'd in some imaginary Space beyond the World, but as being scituated in the World, constituted as it now is, and consequently as having their action upon each other liable to be promoted, or hindred, or modify'd by the Actions of other Bodies besides them: as in a Clock, a small force apply'd to move the Index to the Figure of 12, will make the Hammer strike often and forcibly against the Bell, and will make a far greater Commotion among the Wheels and Weights, then a far greater force would do, if the Texture and Contrivance of the Clock did not abundantly contribute to the Production of so great an Effect. And in agitating Water into Froth, the Whiteness would never be produc'd by that Motion, were it not that the Sun, or other Lucid Body, shining upon that Aggregate of small Bubbles, enables them to reflect confusedly

Tedly great store of little, and as it were contiguous lucid images to the Eye. And so the giving to a large Metalline Speculum a Concave figure, would never enable it to set Wood on fire, and even to melt down Mettals readily, if the Sun beams, that in Cloudless dayes do, as to sense, fill the Air, were not by the help of that Concavity, thrown together to a Point. And to shew You by an eminent Instance, how various and how differing Effects the Same action of a Natural Agent may produce, according to the several Dispositions of the Bodies it works upon, do but consider, that in two Eggs, the one Prolifick, the other Barren, the sense can perhaps distinguish before Incubation no difference at all; and yet these Bodies, outwardly so like, do so differ in the internal disposition of their parts, that if they be both expos'd to the same degree of Heat, (whether of a Hen, or an Artificial Oven,) that Heat will change the one into a putrid

trid and stinking Substance, and the other into a Chick, furnish'd with great variety of Organical parts of very differing consistences, and curious as well as differing Textures.

4. I do not deny, but that Bodies may be said, in a very favourable sense, to have those Qualities we call Sensible, though there were no Animals in the World: for a Body in that case may differ from those Bodies, which now are quite devoid of Quality, in its having such a disposition of its Constituent Corpuscles, that in case it were duely apply'd to the Sensory of an Animal, it would produce such a sensible Quality, which a Body of another Texture would not; as though if there were no Animals, there would be no such thing as Pain, yet a Pin may upon the account of its Figure be fitted to cause pain, in case it were mov'd against a Man's finger, whereas a Bullet, or other blunt Body mov'd against it with no greater force,

force, will not cause any such perception of pain. And thus Snow, though if there were no Lucid Body nor Organ of Sight in the World, it would exhibit no Colour at all, (for I could not find it had any in places exactly darkned,) yet it hath a greater disposition than a Coal or Soot to reflect store of Light outwards, when the Sun shines upon them all three. And so we say, that a Lute is in tune, whether it be actually plaid upon or no, if the Strings be all so duly stretcht, as that it would appear to be in Tune, if it were play'd upon. But as if You should thrust a Pin into a man's Finger, both a while before and after his Death, though the Pin be as sharp at one time as at another, and maketh in both cases alike a Solution of Continuity; yet in the former case, the Action of the Pin will produce Pain, and not in the latter, because in this the prick'd Body wants the Soule, and consequently the Perceptive Faculty: so
if

if there were no Sensirive Beings, those Bodies that are now the Objects of our Senses, would be but *dispositively*, if I may so speak, endow'd with Colours, Tasts, and the like; and *actually* but onely with those more Catholick Affections of Bodies, Figure, Motion, Texture, &c.

To illustrate this yet a little farther, suppose a Man should beat a Drum at some distance from the mouth of a Cave, conveniently scituated to return the Noise he makes; although Men will presently conclude, that That Cave hath an Echo, and will be apt to fancy upon that account some Real Property in the place, to which the Echo is said to belong, and although indeed the same Noise made in many other of the neighbouring places, would not be reflected to the Eare, and consequently would manifest those places to have no Echos; yet to speak Physically of things, this Peculiar Quality or Property

perty we fancy in the Cave, is in It no-
 thing else but the Hollowness of its Fi-
 gure, whereby 'tis so dispos'd, as when
 the Air beats against it, to reflect the
 Motion towards the place whence that
 Motion began; and that which passeth
 on this occasion is indeed but this, That
 the Drum stick falling upon the Drum,
 makes a Percussion of the Air, and puts
 that Fluid Body into an Undulating
 Motion, and the Aery Waves thrust-
 ing on one another, 'till they arrive at
 the hollow Superficies of the Cave,
 have by reason of its resistance and fi-
 gure, their Motion determin'd the con-
 trary way, namely backwards towards
 that part where the Drum was, vvhen
 it vvas struck; so that in That, vvhich
 here happens, there intervenes nothing
 but the Figure of one Body, and the
 Motion of another, though if a Man's
 Ear chance to be in the way of these
 Motions of the Air forwards and back-
 vvards, it gives him a Perception of
 them,

them, which he calls Sound; and because these Perceptions, which are suppos'd to proceed from the same percussion of the Drum, and thereby of the Air, are made at distinct times one after another, That hollow Body, from whence the Last Sound is conceiv'd to come to the Air, is imagin'd to have a peculiar Faculty, upon whose account Men are wont to say, that such a place hath an Echo.

5. And whereas one Body doth often seem to produce in another divers such Qualities, as we call Sensible, which Qualities therefore seem not to need any reference to our Senses, I consider, that when one Inanimate Body works upon another, there is nothing really produc'd by the Agent in the Patient, save some Local Motion of its Parts, or some Change of Texture consequent upon that Motion; and so, if the Patient come to have any sensible Quality, that it had not before, it acquires it up-

F

on

on the same account, upon which other Bodies have it, and it is but a consequent to this Mechanical Change of Texture, that by means of its Effects upon our Organs of Sense, we are induc'd to attribute this or that sensible Quality to it. *As* in case a Pin should chance by some inanimate Body to be driven against a Man's Finger, that which the Agent doth, is but to put a sharp and slender Body into such a kind of Motion, and that which the Pin doth, is to pierce into a Body that it meets with, not hard enough to resist its Motion, and so that upon this there should ensue such a thing as Pain, is but a Consequent, that superadds nothing of Real to the Pin that occasions that Pain. *So* if a piece of Transparent Ice be, by the falling of some heavy and hard Body upon it, broken into a Gross Powder that looks Whitish, the falling Body doth nothing to the Ice but break it into very small Fragments, lying confusedly upon one another,

another; though by reason of the Fabrick of the World, and of our Eyes, there doth in the day time upon this Commiution, ensue such a kind of copious Reflection of the incident Light to our Eyes, as we call Whirenesse: and when the Sun, by thawing this broken Ice, destroyes the Whiteness of that portion of Matter, and makes it become Diaphanous, which it was not before, it doth no more then alter the Texture of the Component parts, by putting them into Motion, and thereby into a new Order; in which, by reason of the disposition of the Pores intercepted betwixt them, they reflect but few of the incident beams of Light, and transmit most of them. Thus when with a Burnisher You polish a rough piece of Silver, that which is really done, is but the Depression of the little Protuberant parts into one Level with the rest of the Superficies; though upon this Mechanical change of the Texture of the

Superficial parts, we Men say, that it hath lost the Quality of Roughness, and acquir'd that of Smoothness, because that whereas before, the little Extancies by their Figure resisted a little the Motion of our Finger, and grated upon them a little, our Fingers now meet with no such offensive Resistance. 'Tis true that the Fire doth thaw Ice, and also both make Wax flow, and enable it to burn a Man's hand, and yet this doth not necessarily argue in it any Inherent Quality of Heat, distinct from the Power it hath of putting the small parts of the Wax into such a Motion, as that their Agitation surmounts their Cohæsion; which Motion, together with their Gravity, is enough to make them *pro tempore* constitute a Fluid Body: and *Aqua Fortis*, without any (sensible) Heat, will make Camphire, cast on it, assume the form of a Liquor distinct from it; as I have try'd, that a strong Fire will also make Camphire fluid:

fluid: not to adde, that I know a Liquor, into which certain Bodies being put, when both it Self, (as well as They,) is *actually cold*, (and consequently when You would not suspect it of an Actual Inhærent Heat) will not onely speedily dissipate many of their parts into Smoak, but leave the rest Black, and burnt almost like a Coal. So that though we suppose the Fire to do no more then variously and briskly to agitate the Insensible parts of the Wax, That may suffice to make us think the Wax endow'd with a Quality of Heat: because if such an Agitation be greater then that of the Spirit, and other parts of our Organs of Touching, That is enough to produce in us that Sensation we call Heat; which is so much a Relative to the Senfory which apprehends it, that vve see, that the same Lukevvarm Water, that is, vvwhose Corpuscles are moderately agitated by the Fire, will appear hot to one of a Man's hands, if That be

very cold; and cold to the other, in case it be very hot, though both of them be the same Man's hands. To be short, if we fancy any two of the Bodies about us, as a Stone, a Mettal, &c. to have nothing at all to do with any other Body in the Universe, 'tis not easy to conceive, either how one can act upon the other, but by Local Motion (of the whole Body, or its Corporeal Effluvia;) or how by Motion it can do any more, then put the Parts of the other Body into Motion too, and thereby produce in them a Change of Scituation and Texture, or of some other of its Mechanical Affections: though this (Passive) Body being plac'd among other Bodies in a World constituted as ours now is, and being brought to act upon the most curiously contriv'd Sentories of Animals, may upon both these accounts exhibit many differing sensible *Phænomena*; which however we look upon them as distinct Qualities, are consequently

sequently but the Effects of the often mention'd Catholick affections of Matter, and deducible from the Size, Shape, Motion (or Rest,) Posture, Order, and the resulting Texture of the Insensible parts of Bodies. And therefore though, for shortness of speech, I shall not scruple to make use of the word *Qualities*, since it is already so generally receiv'd, yet I would be understood to mean them in a sense suitable to the Doctrine above deliver'd. As if I should say, that Roughness is apt to grate and offend the Skin, I should mean, that a File or other Body, by having upon its Surface a multitude of little hard and exstant Parts, and of an Angular or sharp Figure, is qualify'd to work the mention'd Effect: and so if I should say, that Heat melts Metals, I should mean, that this Fusion is effected by Fire, or some other Body, which by the various and vehement Motion of its insensible parts, does to us appear Hot. And hence,

(by the way,) I presume You will easily guess at what I think of the Controversy so hotly disputed of late betwixt two parties of Learned Men, whereof the One would have all Accidents to worke onely in virtue of the Matter they reside in, and the Other would have the Matter to act onely in virtue of its Accidents: for considering, that on the one side, the Qualities, we here speak of, do so depend upon Matter, that they cannot so much as have a Being but in, and by it; and on the other side, if all Matter were but quite devoid of Motion, (to name now no other Accidents,) I do not readily conceive, how it could operate at all, I think it is safest to conclude, That neither Matter, nor Qualities apart, but both of them conjointly do perform, what we see done by Bodies to one another, according to the Doctrine of Qualities just now deliver'd.

of

(Of the Nature of a Forme.)

VII. **W**E may now advance somewhat farther, and consider, that Men having taken notice, that certain conspicuous Accidents were to be found associated in some Bodies, and other Conventions of Accidents in other Bodies, they did for conveniency, and for the more expeditious Expression of their Conceptions agree to distinguish them into several Sorts, which they call *Genders* or *Species*, according as they referr'd them either upwards to a more Comprehensive sort of Bodies, or downward to a narrower Species, or to Individuals: As, observing many Bodies to agree in being Fusible, Malleable, Heavy, and the like, they gave to that sort of Body the name of *Mettal*, which is a *Genus* in reference to Gold, Silver, Lead, and but a *Species* in reference to that sort of mixt Bodies they call

call *Fossilia*. This *superior Genus* comprehending both Metals, Stones, and diverse other Concretions, though it self be but a *Species* in respect of Mixt Bodies. Now when any Body is referr'd to any particular *species*, (as of a Metal, a Stone, or the like,) because Men have for their Convenience agreed to signifie all the Essentials requisite to constitute such a Body by one Name, most of the Writers of Physicks have been apt to think, that besides the common Matter of all Bodies, there is but One thing that discriminates it from other Kinds, and makes it what it is, and this for brevities sake they call a *Forme*, which, because all the Qualities and other Accidents of the Body must depend on it, they also imagine to be a very Substance, and indeed a kind of Soule, which united to the gross Matter composes with it a Natural Body, and acts in it by the several Qualities to be found therein, which Men are wont

to ascribe to the Creature so compos'd.
 But as to this affair, I observe, that if
 (for Instance) You ask a Man, what
 Gold is, if he cannot shew you a piece
 of Gold, and tell You, This is Gold,
 he will describe it to You as a Body,
 that is extremely Ponderous, very Mal-
 leable and Ductile, Fusible and yet Fixt
 in the Fire, and of a Yellowish colour:
 and if You offer to put off to him a
 piece of Brass for a piece of Gold, he
 will presently refuse it, and (if he under-
 stand Mettals) tell You, that though
 Your Brass be coloured like it, 'tis not
 so heavy, nor so malleable, neither will
 it like Gold resist the utmost brunt of
 the Fire, or resist *Aqua Fortis*: and if
 You ask Men what they mean by a
 Ruby, or Niter, or a Pearl, they will
 still make You such Answers, that You
 may clearly perceive, that whatever
 Men talk in Theory of Substantial
 Forms, yet That, upon whose account
 they really distinguish any one Body
 from

from others, and refer it to this or that *Species* of Bodies, is nothing but an Aggregate or Convention of such Accidents, as most men do by a kind of Agreement (for the Thing is more Arbitrary then we are aware of) think necessary or sufficient to make a Portion of the Universal Matter belong to this or that Determinate *Genus* or *Species* of Natural Bodies. And therefore not onely the Generality of Chymists, but diverse Philosophers, and, what is more, some Schoolmen themselves, maintain it to be possible to Transmute the ignobler Mettals into Gold, which argues, that if a Man could bring any Parcel of Matter to be Yellow, and Malleable, and Ponderous, and Fixt in the Fire, and upon the Test, and Indissoluble in *Aqua Fortis*, and in some to have a concurrence of all those Accidents, by which Men try True Gold from False, they would take it for True Gold without scruple. And in this case the generality

ty of Mankind would leave the School-Doctors to dispute, whether being a Factitious Body, (as made by the Chymists art,) it have the Substantial Form of Gold, and would upon the account of the Convention of the freshly mention'd Accidents let it pass Current amongst them, notwithstanding most Mens greater care, not to be deceived in a matter of this nature then in any other. And indeed, since to every Determinate *Species* of Bodies, there doth belong more then One Quality, and for the most part a concurrence of Many is so Essential to That sort of Bodies, that the want of any of them is sufficient to exclude it from belonging to that *Species*: there needs no more to discriminate sufficiently any One kind of Bodies from all the Bodies in the World, that are not of that kind; as the Chymists *Luna fixa*, which they tell us wants not the Weight, the Malleableness, nor the Fixtness, nor any other property of Gold,

Gold, except the Yellowness, (which makes them call it White Gold,) would by reason of that want of Colour be easily known from true Gold. And you will not wonder at this, if you consider, that those Sphæres and Parallelopipeds differ but in Shape, yet this difference alone is the ground of so many others, that *Euclid* and other Geometricians have demonstrated, I know not how many Properties of the one, which do no way belong to the other, and† *Aristotle* himself somewhere tells us, That a Sphære is compos'd of Brasse and Roundness. And I suppose it would be thought a Man's own fault, if he could not distinguish a Needle from a File, or a Key from a pair of Scissors, though these being all made of Iron, and differing but in Bignesse and Shape, are less remarkably diverse then Natural Bodies, the most part of which differ from each other in far more Accidents

† *Arist. Metaph. lib. 7. cap. 8.*

then Two. Nor need we think that Qualities being but Accidents, they cannot be *essential* to a Natural Body; for Accident, as I formerly noted, is sometimes oppos'd to Substance, and sometimes to Essence: and though an Accident can be but accidental to Matter, as it is a Substantial thing, yet it may be essential to this or that particular Body; as in *Aristotle's* newly mention'd Example, though Roundness is but Accidental to Brass, yet 'tis Essential to a Brasen Sphære; because, though the Brasse were devoid of Roundness, (as if it were Cubical, or of any other figure,) it would still be a Corporeal Substance, yet without that Roundness it could not be a Sphære: wherefore since an Aggregate or Convention of Qualities is enough to make the portion of Matter 'tis found in, what it is, and denominate it of this or that Determinate sort of Bodies; and since those Qualities, as we have seen already, do themselves

themselves proceed from those more Primary and Catholick affections of Matter, Bulk, Shape, Motion or Rest, and the Texture thence resulting, why may we not say, that the Form of a Body being made up of those Qualities united in one Subject, doth likewise consist in such a Convention of those newly nam'd Mechanical Affections of Matter, as is necessary to constitute a Body of that Determinate kind. And so, though I shall for brevities sake retain the word *Forme*, yet I would be understood to mean by it, not a Real *Substance* distinct from Matter, but onely the Matter it self of a Natural Body, consider'd with its peculiar manner of Existence, which I think may not inconveniently be call'd either its *Specific* or its *Denominating State*, or its *Essential Modification*, or, if you would have me express it in one word, its *Stamp*: for such a Convention of Accidents is sufficient to perform the Offices

ces that are necessarily requir'd in what Men call a Forme, since it makes the Body such as it is, making it appertain to this or that Determinate Species of Bodies, and discriminating it from all other Species of Bodies whatsoever: as for Instance, Ponderousness, Ductility, Fixtneſſe, Yellowneſſe, and ſome other Qualities, concurring in a portion of Matter, do with it conſtitute Gold, and making it belong to that Species we call Mettals, and to that ſort of Mettals we call Gold, do both denominate and diſcriminate it from Stones, Salts, Marchaſites, and all other ſorts of Bodies that are not Mettals, and from Silver, Braſs, Copper, and all Mettals except Gold. And whereas 'tis ſaid by ſome, that the Forme alſo of a Body ought to be the Principle of its Operations, we ſhall hereafter conſider in what ſenſe That is to be admitted or rejected; in the mean time it may ſuffice us, that even in the Vulgar Philoſophy 'tis acknow-

ledg'd, that Natural Things for the most part operate by their Qualities, as Snow dazles the Eyes by its Whiteness, and Water scatter'd into drops of Rain falls from the Clouds upon the account of its Gravity. To which I shall adde, that how great the power may be, which a Body may exercise by virtue of a single Quality, may appear by the Various and oftentimes Prodigious Effects, which Fire produces by its Heat, when thereby it melts Mettals, calcines Stones, destroys whole Woods and Cities &c. And if several Active Qualities convene in one Body, (as that which in our Hypothesis is meant by Forme, usually comprises several of them,) what great things may be thereby perform'd, may be somewhat guess'd at by the strange things we see done by some Engines, which, being, as Engines, undoubtedly devoid of Substantial Forms, must do those strange things they are admir'd for, by virtue of those Accidents, the
Sh ape

Shape, Size, Motion, and Contrivance, of their parts. Not to mention, that in our Hypothesis, besides those Operations that proceed from the Essential Modification of the Matter, as the Body (compos'd of Matter and necessary Accidents) is consider'd *per modum unius*, as one Entire Corporeal Agent, it may in diverse cases have other Operations, upon the account of those particular Corpuscles, which though they concur to compose it, and are in reference to the whole consider'd but as its parts, may yet retain their own particular Nature, and diverse of the peculiar Qualities: as in a Watch, besides those things which the Watch performs as such, the several parts whereof it consists, as the Spring, the Wheels, the String, the Pins, &c. may have each of them its peculiar Bulk, Shape, and other Attributes, upon the account of one or more of which, the Wheel or Spring &c. may do other things then

what it doth, as meerly a Constituent part of the Watch. And so in the Milk of a Nurse, that hath some hours before taken a Potion, though the Corpuscles of the purging Medicine appear not to sense distinct from the other parts of the Milk, which in far greater numbers concur with them, to constitute that white Liquor, yet these Purgative Particles, that seem but to be part of the Matter whereof the Milk consists, do yet so retain their own Nature and Qualities, that being suck'd in with the rest by the Infant, they quickly discriminate and discover themselves by purging him. But of this Subject more hereafter.

*(Of Generation, Corruption,
and Alteration.)*

VIII. IT now remains that we declare, what, according to the Tenour of our Hypothesis, is to be meant by *Generation, Corruption, and Alteration;*
(Three

(Three Names; that have very much puzzled and divided Philosophers.) In order hereunto we may consider,

1. That there are in the World great store of Particles of Matter, each of which is too small to be, whilst single, Sensible; and being Entire, or Undivided, must needs both have its Determine Shape, and be very Solid. Inasmuch, that though it be *mentally*, and by Divine Omnipotence divisible, yet by reason of its Smallness and Solidity, Nature doth scarce ever actually divide it; and these may in this sense be call'd *Minima* or *Prima Naturalia*.

2. That there are also Multitudes of Corpuscles, which are made up of the Coalition of several of the former *Minima Naturalia*; and whose Bulk is so small, and their Adhæſion so close and strict, that each of these little Primitive Concretions or Clusters (if I may so call them) of Particles is singly below the discernment of Sense, and though not

absolutely indivisible by Nature into the *Prima Naturalia* that compos'd it, or perhaps into other little Fragments, yet, for the reasons freshly intimated, they very rarely happen to be actually dissolv'd or broken, but remain entire in great variety of sensible Bodies, and under various forms or disguises. As, not to repeat, what we lately mention'd, of the undestroy'd purging Corpuscles of Milk; we see, that even Grosser and more compounded Corpuscles may have such a permanent Texture: For Quicksilver, for instance, may be turn'd into a red Powder for a Fusible and Malleable Body, or a Fugitive Smoak, and disguis'd I know not how many other wayes, and yet remain true and recoverable Mercury. And these are as it were the Seeds, or immediate Principles of many sorts of Natural Bodies, as Earth, Water, Salt, &c. and those singly insensible, become capable, when united, to affect the Sense: as I have try'd,

try'd, that if good Camphire be kept a while in pure Spirit of Wine, it will thereby be reduc'd into such Little parts, as totally to disappear in the Liquor, without making it look less clear then fair Water, and yet, if into this Mixture you pour a competent quantity of Water, in a moment the scatter'd Corpuscles of the Camphire will, by reuniting themselves, become White, and consequently Visible, as before their Dispersion.

3. That as well each of the *Minima Naturalia*, as each of the Primary Clusters above mention'd, having its own Determinate Bulk & Shape, when these come to adhere to one another, it must *alwaies* happen, that the Size, and *often*, that the Figure of the Corpuscle compos'd by their Juxta-position and Cohæſion, will be chang'd: and *not seldome* too, the Motion either of the one, or the other, or both, will receive a new Tendency, or be alter'd as to its Velocity,

or otherwise. And the like will happen, when the Corpuscles, that compose a Cluster of Particles, are disjoyn'd, or any thing of the little Mass is broken off. And whether any thing of Matter be added to a Corpuscle, or taken from it in either case, (as we just now intimated,) the Size of it must necessarily be alter'd, and for the most part the Figure will be so too, whereby it will both acquire a Congruity to the Pores of some Bodies, (and perhaps some of our Sensories,) and become Incongruous to those of others, and consequently be qualify'd, as I shall more fully shew you hereafter, to operate on diverse occasions, much otherwise then it was fitted to do before.

4. That when many of these insensible Corpuscles come to be associated into one visible Body, if many or most of them be put into Motion, from what cause soever the Motion proceeds, That it self may produce great Changes, and

new

new Qualities in the Body they compose; for *not onely* Motion may perform much, even when it makes not any visible Alteration in it, as Air put into swift Motion, (as when it is blown out of Bellows) acquires a new Name, and is call'd *Wind*, and to the Touch appears far colder then the same *Air* not so form'd into a Stream: and Iron, by being briskly rubb'd against Wood or other Iron, hath its small parts so agitated, as to appear hot to our Sense: *but* this Motion oftentimes makes visible Alterations in the Texture of the Body into which it is receiv'd, for alwaies the Moved parts strive to communicate their Motion, or somewhat of the degree of it, to some parts that were before either at Rest, or otherwise mov'd, and oftentimes the same Mov'd parts do thereby either disjoyn, or break some of the Corpuscles they hit against, and thereby change their Bulk, or Shape, or both, and either drive some
of

of them quite out of the Body, and perhaps lodge themselves in their places, or else associate them anew with others. Whence it usually follows, that the Texture, is for a while at least, and, unlesse it be very stable and permanent, for good and all, very much alter'd, and especially, in that the Pores or little Intervals intercepted betwixt the component Particles, will be chang'd as to Bigness, or Figure, or both, and so will cease to be commensurate to the Corpuscles that were fit for them before, and become commensurate to such Corpuscles of other Sizes and Shapes, as till then were incongruous to them. Thus we see that Water, by loosing the wonted agitation of its parts, may acquire the Firmnesse and Brittlenesse we find in Ice, and loose much of the Transparency it had whilst it was a Liquor. Thus also by very hard rubbing two pieces of Resinous Wood against one another, we may make them throw
out

out diverse of their looser parts into Steams and visible Smoak, and may, if the Attrition be duely continued, make that commotion of the parts so change the Texture of the whole, as afterwards to turn the superficial parts into a kind of Coal. And thus Milk, especially in hot weather, will by the intestine, though languid, Motions of its parts, be in a short time turn'd into a thinner sort of liquor then Milk, and into Cream, and this (last nam'd) will by being barely agitated in a Churn, be turn'd in a shorter time into that Unctuous and consistent Body we call Butter, and into thin, fluid, and sower Butter-milk. And thus (to dispatch) by the bruising of Fruit, the Texture is commonly so chang'd, that as we see particularly in Apples, that the Bruis'd part soon comes to be of another nature then the Sound part, the one differing from the other both in Colour, Taste, Smell, and Consistence. So that (as we have already inculcated)

Local

Local Motion hath, of all other affecti-
 ons of Matter, the greatest Interest in
 the Altering and Modifying of it, since
 it is not onely the Grand *Agent* or *Effi-*
cient among Second Causes, but is also
 oftentimes one of the principal things
 that *constitutes the Forme* of Bodies: as
 when two Sticks are set on fire by long
 and vehement Attrition, *Local Motion*
 is not onely that which kindles the
 Wood, and so as an Efficient produces
 the Fire, but is That which principally
 concurs to give the produced Stream
 of shining Matter, the name and nature
 of Flame: and so it concurs also to con-
 stitute all Fluid Bodies.

5. And that since we have formerly
 seen, that 'tis from the Size, Shape, and
 Motion of the small parts of Matter,
 and the Texture that results from the
 manner of their being dispos'd in any
 one Body, that the Colour, Odour,
 Taft, and other qualities of that Body
 are to be deriv'd, it will be easie for us
 to

to recollect, That such Changes cannot happen in a portion of Matter, without so much varying the Nature of it, that we need not deride the antient Atomists, for attempting to deduce the *Generation* and *Corruption* of Bodies from the sam'd *ἀσμενισμός* & *δύσμενισμός*, the *Convention* and *Dissolution*, and the *Alterations* of them, from the *transposition* of their (suppos'd) Atoms: For though indeed Nature is wont in the Changes she makes among things Corporeal, to employ all the *three* wayes, as well in *Alterations*, as *Generations* and *Corruptions*; yet if they onely meant, as probably enough they did, That of the *three* waies propos'd, the First was wont to be the Principal in the *Generation* of Bodies, the second in the *Corruption*, & the third in their *Alterations*, I shall not much oppose this Doctrine: though I take the Local Motion or *Transposition* of Parts, in the same portion of Matter, to bear a great stroak as well in reference to

to *Generation* and *Corruption*, as to *Alteration*: as we see when Milk, or Flesh, or Fruit, without any remarkable addition or loss of parts turns into Maggots, or other Insects; and as we may more conspicuously observe in the *Præcipitation* of Mercury without addition, in the *Vitrification* of Mettals, and other Chymical Experiments to be hereafter mention'd.

These things premis'd, it will not now be difficult to comprise in few words such a Doctrin, touching the *Generation*, *Corruption*, and *Alteration* of Bodies, as is suitable to our *Hypothesis*, and the former Discourse. For if in a parcel of Matter there happen to be produc'd (it imports not much how) a Concurrence of all those Accidents, (whether those onely, or more) that Men by tacite agreement have thought *necessary* and *sufficient* to constitute any one *Determinate Species* of things corporeal, then we say, That a Body be-
longing

longing to that *Species*, as suppose a Stone, or a Mettal, is *Generated*, or produc'd *de novo*. Not that there is really any thing of *Substantial* produc'd, but that those parts of Matter, that did indeed before præexist, but were either scatter'd and shar'd among other Bodies, or at least otherwise dispos'd of, are now brought together, and dispos'd of after the manner requisite, to entitle the Body that results from them to a *new Denomination*, and make it appertain to such a *Determinate Species* of Natural Bodies, so that no new *Substance* is in *Generation* produc'd, but onely That, which was *præexistent*, obtains a new *Modification*, or manner of Existence. Thus when the Spring, and Wheels, and String, and Balance, and Index &c. necessary to a Watch, which lay before scatter'd, some in one part, some in another of the Artificer's Shop, are first set together in the Order requisite to make such an Engine, to
shew

shew how the time passes, a Watch is said to be *made*: not that any of the mention'd Material parts is *produc'd de novo*, but that till then the divided Matter was not so *contriv'd* and put together, as was requisite to constitute such a thing, as we call a Watch. And so when Sand and Ashes are well melted together, and suffer'd to cool, there is Generated by the Colliquation that sort of Concretiou we call *Glaß*, though it be evident, that its Ingredients were both præexistent, and do but by their *Association* obtain a New manner of existing together. And so when by the Churning of Creame, Butter and Butter-milk are generated, we find not any thing Substantial Produc'd *de novo* in either of them, but onely that the *Serum*, and the fat Corpuscles, being put into Local Motion, do by their frequent Occursions extricate themselves from each other, and associate themselves in the new manner, requisite to constitute
the

the Bodies, whose names are given them.

And as a Body is said to be *generated*, when it first appears clothed with all those Qualities, upon whose Account Men have been pleas'd to call some Bodies *Stones*; others, *Mettals*; others, *Salts*, &c. so when a Body comes to loose *all* or *any* of those Accidents that are *Essential*, and necessary to the constituting of such a Body, it is then said to be *corrupted* or destroy'd, and is no more a Body of *that Kind*, but looses its Title to its former Denomination. Not that any thing *Corporeal* or *Substantial* *perishes* in this *Change*, but only that the Essential Modification of the Matter is destroy'd: and though the Body be still a *Body*, (no Natural Agent being able to *annihilate* Matter,) yet 'tis no longer *such a Body*, as 'twas before, but perisheth in the capacity of a Body of that Kind. Thus if a Stone, falling upon a Watch, break it to pieces;

H

as,

as, when the Watch was made there was no new Substance produc'd, all the Material parts (as the Steel, Brass, String, &c.) being præexistent some where or other, (as in Iron, and Copper-Mines, in the Bellies of those Animals, of whose Guts Men use to make Strings;) so not the least part of the Substance of the Watch is lost, but onely displac'd and scatter'd; and yet that Portion of Matter ceases to be a *Watch* as it was before. And so (to resume our late Example) when Creame is by Churning turn'd into Butter, and a Serous Liquor, the parts of the Milk remain associated into those two Bodies, but the White Liquor perisheth in the capacity of Milk. And so when Ice comes to be thaw'd in exactly clos'd Vessels, though the Corruption be produc'd onely (for ought appears) by introducing a new Motion and Disposition into the parts of the Frozen Water, yet it thereupon ceases to be *Ice*, howe-

ver

ver it be as much *Water*, and conse-
 quently as much a *Body*, as before it was
 frozen or thaw'd. These and the like
 Examples may teach us rightly to un-
 derstand that common Axiom of Na-
 turalists, *Corruptio unius est generatio*
alterius; & è contrà: for since it is ac-
 knowledged on all hands, that Matter
 cannot be annihilated, and since it ap-
 pears by what we have said above, that
 there are some Properties, namely *Size*,
Shape, *Motion*, (or in its absence, *Rest*,)
 that are inseparable from the actual parts
 of Matter; and since also the Coalition
 of any competent number of these parts
 is sufficient to constitute a Natural Bo-
 dy, endow'd with diverse sensible Qua-
 lities; it can scarce be otherwise, but that
 the same Agents, that shatter the
 Frame, or *destroy* the Texture of one
 Body, will by shuffling them together,
 and disposing them after a New manner,
 bring them to *constitute* some new sort
 of Bodies: As the same thing, that by
 burning

burning destroyes Wood, turns it into Flame, Soot, and Ashes. Onely I doubt, whether the Axiome do generally hold true, if it be meant, That *every Corruption must end in the Generation of a Body, belonging to some particular Species of things*, unlesse we take Powders and fluid Bodies indefinitely for *Species* of Natural Bodies; since it is plain, there are multitudes of Vegetables, and other Concretions, which, when they rot, do not, as some others do, turn into Worms, but either into some slimy or watery Substance, or else (which is the most usuall) they crumble into a kind of Dust or Powder, which, though look'd upon as being the Earth, into which rotten Bodies are at length resolv'd, is very far from being of an Elementary nature, but as yet a Compound Body, retaining some, if not many, Qualities, which often makes the Dust of one sort of Plant or Animal differ much from that of another. And This
will

will supply me with this Argument *Ad hominem*, viz. That since in those *violent Corruptions* of Bodies, that are made by Outward Agents, shattering them into pieces, if the Axiome hold true, the New *Bodies emergent* upon the Dissolution of the Former, must be really *Natural Bodies*, as (indeed divers of the Moderns hold them to be,) and Generated according to the course of Nature, as when Wood is destroy'd by Fire, and turn'd partly into Flame, partly into Soot, partly into Coals, and partly into Ashes; I hope we may be allow'd to conclude, That those *Chymical Productions*, which so many would have to be but *Fæctitious Bodies*, are *Natural ones*, and regularly Generated. For it being the same Agent, the Fire, that operates upon Bodies, whether they be expos'd to it in close Glasses, or in Chimnies, I see no sufficient reason, why the Chymical Oyls, and Volatile Salts, and other things which

Spagirites obtain from mixt Bodies, should not be accounted Natural Bodies, as well as the Soot, and Ashes, and Charcoal, that by the same fire are obtain'd from Kindled Wood.

But before we passe away from the mention of the Corruption of Bodies, I must take some notice of what is call'd their *putrefaction*. This is but a Peculiar kind of Corruption, wrought slowly (whereby it may be distinguish'd from Destruction by Fire, and other nimble Agents) in Bodies: it happens to them for the most part by means of the Air, or some other Ambient Fluid, which by penetrating into the Pores of the Body, and by its agitation in them, doth usually call out some of the more Agile and lesse entangled parts of the Body, and doth almost ever loosen and dislocate the parts in general, and thereby so change the Texture, and perhaps too the Figure, of the Corpuscles, that compose it, that the Body, thus chang'd, acquires

acquires Qualities unsuitable to its Former Nature, and for the most part offensive to Our Senses, especially of Smelling and Tasting: which last clause I therefore adde, not onely because the Vulgar look not upon the Change of an Egge into a Chick as a *Corruption*, but as a *Perfection* of the Egge; but because also I think it not improbable, that if by such slow Changes of Bodies, as make them loose their former Nature, and might otherwise passe for *Putrefaction*, many Bodies should acquire better Sents or Tasts then before; or if Nature, Custom, or any other cause should much alter the Texture of our Organs of Tasting and Smelling, it would not perhaps be so well agreed on what should be call'd Putrefaction, as that imports an *impairing Alteration*, but Men would find some favourabler Notion for such Changes. For I observe, that Medlars, though they acquire in length of time such a Colour and

Softness as rotten Apples, and other putrify'd Fruits do, yet, because their Taste is not then harsh as before, we call that *Ripeness* in them, which otherwise we should call *Rottenness*. And though upon the Death of a fourfooted Beast, we generally call that Change, which happens to the Flesh or Bloud, Putrefaction, yet we passe a more favourable judgment upon That, which happens to the Flesh and other softer parts of that Animal, (whether it be a kind of large Rabbits, or very small and hornlesse Deer,) of which in *China*, and in the *Levant* they make Musk; because by the Change, that ensues the Animals death, the Flesh acquires not an *odious*, but a *grateful Smell*. And we see, that some Men, whose Appetites are gratified by Rotten Cheese, think it Then not to have *degenerated*, but to have attain'd its *best State*, when having lost its former Colour, Smell, and Taste, and, which is more, being in great part turn'd

turn'd into those Insects call'd Mites, 'tis both in a Philosophical sense *corrupted*, and in the æstimate of the generality of Men grown *Putrid*. But because it very seldom happens, that a Body by Generation acquires no other Qualities, then just those that are absolutely *necessary*, to make it belong to the *Species* that Denominates it; therefore in most Bodies there are diverse other Qualities that may *be* there, or may be *missing*, without Essentially changing the Subject: as Water may be clear or muddy, odorous or stinking, and still remain Water; and Butter may be white or yellow, sweet or rancid, consistent or melted, and still be call'd Butter. Now therefore whensoever a Parcel of Matter does *acquire* or *loose* a Quality, that is not *Essential* to it, That Acquisition or Loss is distinctly call'd *Alteration*, (or by some, *Mutation*;) the Acquist onely of the Qualities that are absolutely *necessary* to constitute its Essential

sentia and Specificall difference, or the Loss of any of *those* Qualities, being such a Change as must not be call'd meer *Alteration*, but have the particular name of Generation or Corruption; both which according to this Doctrine appear to be but several *Kinds of Alteration*, taken in a large sense, though they are distinguish'd from it in a more strict and Limited acception of that Terme.

And here we have a fair Occasion to take notice of the Fruitfulnesse and Extent of our Mechanical Hypothesis: For since according to our Doctrine, the World we live in is not a Movelesse or Indigested Mass of Matter, but an *Αὐτοκίνητος*, or *Self moving Engine*, wherein the greatest part of the common Matter of all Bodies is alwaies (though not still the same parts of it) in Motion; & wherein Bodies are so close set by one another, that (unlesse in some very few and extraordinary, and as it were Præternatural

ternatural cases) they have either no Vacuities betwixt them, or onely here and there interpos'd, and very small ones. And since, according to us, the various *manner* of the *Coalition* of several *Corpuscles* into one visible *Body* is enough to give them a peculiar Texture, and thereby fitt them to exhibit divers sensible Qualities, and to become a Body, sometimes of one Denomination, and sometimes of another; it will very naturally follow, that from the various Occursions of those innumerable swarms of little Bodies, that are mov'd to and fro in the World, there will be many fitted to stick to one another, and so compose Concretions; and many (though not in the self same place) disjoyn'd from one another, and agitated apart; and multitudes also that will be driven to associate themselves, now with one Body, and presently with another. And if we also consider on the one side, that the Sizes of the small Particles of
Matter

Matter may be very *various*, their Figures almost *innumerable*, and that if a parcel of Matter do but happen to stick to one Body, it may chance to give it a new Quality, and if it adhere to another, or hit against some of its Parts, it may constitute a Body of another Kind; or if a parcel of Matter be knockt off from another, it may barely by That, leave It, and become it self of another Nature then before. If, I say, we consider these things on the one side; and on the other side, that (to use *Lucretius* his Comparifon) all that innumerable multitude of Words, that are contain'd in all the Languages of the World, are made of the various Combinations of some of the 24 Letters of the Alphabet; 'twill not be hard to conceive, that there may be an incomprehensible variety of Affociations and Textures of the Minute parts of Bodies, and consequently a vast Multitude of Portions of Matter endow'd with store enough of differing

differing. Qualities, to deserve distinct Appellations, though for want of heedfulness and fit Words, Men have not yet taken so much notice of their lesse obvious Varieties, as to sort them as they deserve, and give them distinct and proper Names. So that though I would not say, that Any thing can immediately be made of Every thing, as a Gold Ring of a *VV*edge of Gold, or Oyl, or Fire of Water, yet since Bodies, having but one common Matter, can be differenc'd but by Accidents, which seem all of them to be the Effects and Consequents of Local Motion, I see not, why it should be absurd to think, that (at least among Inanimate Bodies) by the Intervention of some very small *Addition* or *Subtraction* of Matter, (which yet in most cases will scarce be needed,) and of an orderly *Series* of *Alterations*, disposing by degrees the Matter to be transmuted, almost of any thing, may at length be made Any thing:

thing: as, though out of a *wedge* of Gold one cannot immediately make a *Ring*, yet by either Wyre-drawing that Wedge by degrees, or by melting it, and casting a little of it into a Mould, That thing may easily be effected. And so though Water cannot immediately be transmuted into Oyl, and much less into Fire, yet if you nourish certain Plants with Water alone, (as I have done,) 'till they have assimilated a great quantity of Water into their own Nature, You may, by committing this Transmuted Water (which you may distinguish and separate from that part of the Vegetable you first put in) to Distillation in convenient Glasses, obtain, besides other things, a true Oyl, and a black combustible Coal, (and consequently Fire,) both of which may be so copious, as to leave no just cause to suspect, that they could be any thing neer afforded by any little Spirituous parts, which may be præsum'd to have
 been

been communicated by that part of the Vegetable, that is first put into the water, to that far greater part of it, which was committed to Distillation.

But, *Pyrophilus*, I perceive the Difficulty and Fruitfulness of my Subject, have made me so much more prolix than I intended, that it will not now be amiss to Contract the Summary of our *Hypothesis*, and give you the Main Points of it with little or no Illustration, and without particular Proofs in a few words. We teach then (but without peremptorily asserting it,)

First, That the Matter of all Natural Bodies is the Same, namely a Substance extended and impenetrable.

2. That all Bodies thus agreeing in the same common Matter, their Distinction is to be taken from those Accidents that do diversify it.

3. That Motion, not belonging to the Essence of Matter, (which retains its whole Nature, when 'tis at Rest,) and
not

not being Originally producible by other Accidents, as They are from It, may be look'd upon as the First and chief *Mood* or Affection of Matter.

4. That Motion, variously determin'd, doth naturally divide the Matter it belongs to, into actual Fragments or Parts; and this Division obvious Experience, (and more eminently, Chymical Operations) manifest to have been made into parts exceedingly *minute*, and very often, too minute to be singly perceivable by our Senses.

5. Whence it must necessarily follow, that each of these Minute Parts, or *minima Naturalia* (as well as every particular Body, made up by the Coalition of any number of them,) must have its Determinate *Bignesse* or *Size*, and its own *Shape*. And these three, namely *Bulk*, *Figure*, and either *Motion* or *Rest*, (there being no Mean between these two) are the three *Primary* and most *Catholick Moods* or Affections of the

the *insensible* parts of Matter, consider'd each of them apart.

6. That when *diverse* of them are consider'd *together*, there will necessarily follow here Below both a certain *Position* or *Posture* in reference to the Horizon (as Erected, Inclining, or Level) of each of them, and a certain *Order*, or placing before, or behind, or besides one another; (as when in a company of Souldiers, one stands *upright*, the other *stoops*, the other *lies along* upon the Ground, they have various *Postures*; and their being plac'd *besides* one another in Ranks, and *behind* one another in Files, are Varieties of their *Order*;) and when many of these small parts are brought to Convene into one Body from their *primary Affections*, and their Disposition, or *Contrivance* as to *Posture* and *Order*, there results That, which by one Comprehensive Name we call the *Texture* of that Body. And indeed these several Kinds of *Location*,

to borrow a Scholastical Terme,) attributed (in this 6th number) to the Minute Particles of Bodies, are so neer of Kinne, that they seem all of them referable to (that One Event of their Convening,) *Scituation*, or *Position*. And these are the Affections that belong to a Body, as it is consider'd in it self, without relation to *sensitive* Beings, or to other Natural Bodies.

7. That yet, there being Men in the World, whose Organs of Sense are contriv'd in such differing wayes, that one Sensory is fitted to receive Impressions from some, and another from other sorts of External Objects, or Bodies without them, (whether these act as Entire Bodies, or by *Emission* of their Corpuscles, or by *propagating* some Motion to the Sensory,) the Perceptions of these Impressions are by men call'd by several Names, as *Heat*, *Colour*, *Sound*, *Odour*; and are commonly imagin'd to proceed from certain distinct
and

and peculiar Qualities in the External Object, which have some resemblance to the Ideas, their action upon the Senses excites in the Mind; though indeed all these Sensible Qualities, and the rest that are to be met with in the Bodies without us, are but the Effects or Consequents of the above mentioned *primary Affections* of Matter, whose Operations are diversify'd according to the nature of the Sensories, or other Bodies they work upon.

8. That when a Portion of Matter, either by the *accession* or *Recess* of Corpuscles, or by the *transposition* of those it consisted of before, or by any *two* or *all* of these waies, happens to obtain a *concurrence of all* those Qualities, which Men commonly agree to be *necessary* and *sufficient* to Denominate the Body, which hath them, either a *Mettal*, or a *Stone*, or the like, and to rank it in any peculiar and determinate *species* of Bodies, Then a Body of that Denomina-

tion is said to be *Generated*.

9. This *Convention of Essential Accidents* being taken (not any of them Apart, but all) together for the Specific Difference that constitutes the Body, and *discriminates* it from all other sorts of Bodies, is by one Name, because consider'd as one *collective* Thing, call'd its *Forme*, (as Beauty, which is made up both of Symmetry of Parts, and Agreeableness of Colours,) which is consequently but a certain *Character*, (as I sometimes call it,) or a *peculiar state of Matter*, or, if I may so name it, an *Essential Modification*: a *Modification*, because 'tis indeed but a *Determinate manner of Existence* of the Matter, and yet an *Essential Modification*, because that though the concurrent Qualities be but *Accidental* to Matter, (which with others in stead of Them, would be Matter still,) yet they are *essentially necessary* to the Particular *Body*, which without those *Accidents* would

not be a Body of that Denomination, as a *Mettal* or a *Stone*, but of some other.

10. Now a Body being capable of many other Qualities, besides those, whose Convention is necessary to make up its Form; the acquisition or *lesse* of any such Quality is, by Naturalists in the more strict sense of that Terme, nam'd *Alteration*: as when Oyl comes to be frozen, or to change colour, or to grow rancid; but if all, or any of the Qualities, that are reputed *essential* to such a Body, come to be *lost* or *destroy'd*, that notable Change is call'd *Corruption*; as when Oyl being boyl'd takes fire, the Oyl is not said to be *alter'd* in the former sense, but *corrupted* or *destroy'd*, and the emergent Fire generated; and when it so happens, that the Body is *slowly corrupted*, and thereby also acquires *Qualities offensive to our Senses*, especially of *Smell* and *Tast*, (as when *Flesh*, or *Fruit* grows rotten,)

that kind of *Corruption* is by a more particular Name call'd *Putrefaction*. But neither in this, nor in any other kind of *Corruption* is there any thing *substantial* destroy'd, (no such thing having been produc'd in *Generation*, and *Matter* it self being on all hands acknowledged *incorruptible*,) but onely that *special connexion of the Parts*, or *manner of their Coexistence*, upon whose account the *Matter*, whilst it was in its former state, was, and was call'd a *Stone*, or a *Mettal*, or did belong to any other *Determinate Species* of *Bodies*.

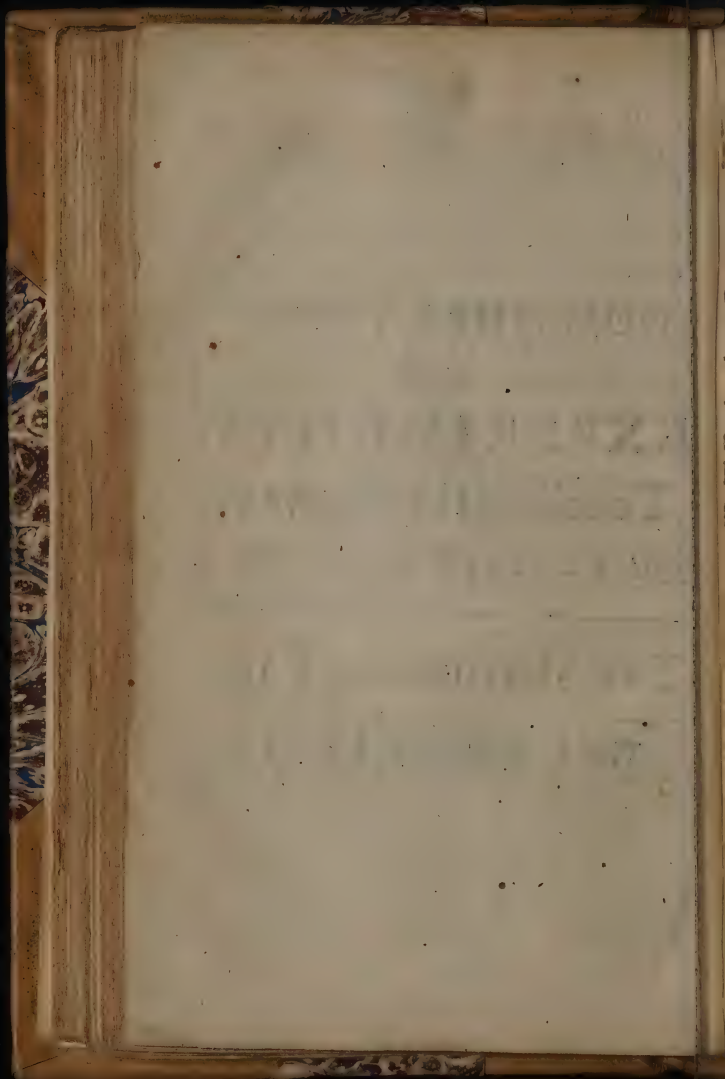


CON.

CONSIDERATIONS
and
EXPERIMENTS,
Touching the *Origine* of
QUALITIES and *FORMS*.

THE HISTORICAL PART.

THE I. SECTION.





The I. SECTION, Containing the *Observations*.

IN the foregoing Notes I have endeavoured with as much Clearness, as the Difficulty of the Subject, and the Brevity I was confined to, permitted to give a Scheme or Summary of the Principles of the Corpuscularian Philosophy, as I apprehended them, by way of a short Introduction to it, at least as far as I judged necessary for the better understanding of what is contain'd in our Notes and Experiments concerning the Productions and Changes of particular Qualities. But though, I hope, I have not so affected Brevity, as to fall into Obscurity; yet since these Principles are built upon the *Phænomena* of Nature, and devis'd in order to the Explanation

cation of them, I know not what I can do more proper to recommend them, then to subjoyn some such Natural *Phænomena*, as either induce me to take up such Notions, or which I was directed to find out by the Notions I had imbrac'd. And since I appeale to the Testimony of Nature to verifie the Doctrine I have been proposing, about the Origine and Production of Qualities, (for that of Formes will require a distinct Discourse,) I think it very proper to set down some Observations of what Nature does, without being overrul'd by the Power and Skill of Man, as well as some Experiments wherein Nature is guided, and as it were Master'd by Art, that so she may be made to attest the Truth of our Doctrine, as well, when she discloses her Self freely, and, if I may so speak, of her Own accord, as when she is as it were Cited to make her Depositions by the Industry of Man. The Observations will be but
the

the more suitable to our Design for being Common and Familiar, as to the *Phænomena*, though perhaps New enough as to the Application to our Purpose. And as for the Experiments, because those that belong more immediately to this or that particular Quality, may be met with in the Notes that treat of It, I thought it not amiss that the Experiments should be both Few in number, and yet so Pregnant, that every one of them should afford such differing *Phænomena*, as may make it applicable to more than One Quality.

I.

The Observation I will begin with shall be fetch'd from what happens in the Hatching of an Egge. For as familiar and obvious a thing as it is, (especially after what the Learned *Fabricius ab Aqua pendente*, and a recenter Anatomist have delivered about them,) that there is a great Change made in the

the substance of the Egge, when 'tis by Incubation turn'd into a Chick: yet, as far as I know, this Change hath not been taken notice of, for the same purpose, to which I am about to apply it.

I consider then, that in a Prolifick Egge, (for Instance that of a Hen,) as well the Liquor of the Yolk, as that of the White, is a Substance, as to sense, Similar. For upon the same account that Anatomists and Physicians call several parts of the humane Body, as Bones, Membranes, &c. Similar, that is, such, as that every Sensible part of it hath the same Nature or Denomination with the whole, as every Splinter of Bone is Bone, as every Shred of Skin is Skin.

And though I find by distilling the Yolks and Whites, they seem to be Dissimilar Bodies, in regard that the White of an Egge (for Example) will afford Substances of a very differing Nature, as Flegme, Salt, Oyl, and Earth, yet

yet (not now to examine whether, or how far these may be esteem'd Productions of the Fire, that are rather obtain'd from the White of the Egge, then were præexistent in it; not to mention this I say,) it doth not appear by Distillation, that the White of an Egg, is other then a Similar Body in the sense above deliver'd. For it would be hard to prove, that one part of the White of an Egg will not be made to yield the same differing Substances by Distillation, that any other part does; and Bones themselves, and other hard parts of a humane Body, that are confessedly Similar, may by Distillation be made to afford Salt, and Phlegme, and Spirit, and Oyl, and Earth, as well as the White of an Egg.

This being thus settled in the First place, we may in the Next consider, that by beating the White of an Egge well with a Whisk, you may reduce it from a somewhat Tenacious into a Fluid Body,

Body, though this Production of a Liquor be, as we elsewhere noted, effected by a Divulsion, Agitation &c. of the parts, that is in a word, by a Mechanical change of the Texture of the Body.

In the Third place I consider, that according to the exactest Observations of Modern Anatomists, which our own Observations do not contradict, the Rudiments of the Chick, lodg'd in the *Cicatricula*, or white Speck upon the Coat of the Yolk, is nourish'd, 'till it have obtain'd to be a great Chick, onely by the White of the Egg; the Yolk being by the Providence of Nature reserv'd as a more strong and solid Aliment, till the Chick have absum'd the White, and be thereby grown great and strong enough to digest the Yolk; and in effect you may see the Chick furnish'd not onely with all the necessary, but divers other parts, as Head, Wings, Legs, and Beak, and Claws, whilst the Yolk seems yet as it were untouch'd.

But

But whether this Observation about the Entireness of the Yolk be precisely true, is not much material to our present purpose, nor would I be thought to build much upon it; since the Yolk it self, especially at that time, is wont to be fluid enough, and to be a Liquor perhaps no less so then the White was, and That is enough for my present purpose.

For in the Last place I consider, that the Nutritive Liquor of an Egg, which is in it self a Body so very soft, that by a little Agitation it may be made Fluid, and is readily enough dissolvable in common cold water, this very Substance, I say, being brooded on by the Hen, will within two or three weeks be transmuted into a Chick, furnish'd with Organical parts, as Eyes, Ears, Wings, Legs, &c. of a very differing Fabrick; and with a good number of Similar ones, as Bones, Cartilages, Ligaments, Tendons, Membranes, &c. which differ very much in Texture from one another;

nother; besides the Liquors, as Blood,
 Chyle, Gall, &c. contain'd in the solid
 parts: So that here we have out of the
 White of an Egg, which is a Substance
 Similar, Insipid, Soft, (not to call it
 Fluid,) Diaphanous, Colourlesse, and
 readily dissoluble in cold water, out of
 this Substance I say, we have by the
 new and various Contrivement of the
 small parts it consisted of, an Animal,
 some of whose parts are not Transpa-
 rent but Opacous; some of them Red,
 as the Bloud; some Yellow or Gree-
 nish, as the Gall; some White, as the
 Brain; some Fluid, as the Bloud, and o-
 ther Juices; some Consistent, as the
 Bones, Flesh, and other stable parts of
 the Body; some Solid and Frangible, as
 the Bones, others Tough and Flexible,
 as the Ligaments, others Soft and loo-
 sly Cohærent, as the Marrow; some
 without Springs, as many of the parts;
 some with Springs, as the Feathers;
 some apt to mingle readily with cold
 water,

water, as the Bloud, the Gall; some not to be *so* dissolv'd in it, as the Bones, the Claws, and the Feathers; some well tasted, as the Flesh and Bloud; some very ill tasted, as the Gall, (for That I have purposely and particularly observ'd.) In a word, we have here produc'd out of such an uniforme Matter as the White of an Egg,

First, new kind of Qualities, as (besides Opacity) Colours, (whereof a single Feather will sometimes afford us Variety,) Odours, Tasts, and Heat in the Heart and Bloud of the Chick; Hardness, Smoothness, Roughness, &c.

Secondly, diverse other Qualities, that are wont to be distinguish'd from Sensible ones, as Fluidity (in the Bloud and aqueous humor of the Eye,) Consistency in the Gristles, Flesh, &c. Hardness, Flexibility, Springynesse, Toughness, unfitness to be dissolv'd in cold water, and several others. To which may probably be added

K

Thirdly,

Thirdly, some Occult Properties as Physicians observe, that some Birds, as young Swallows, young Magpies afford Specifick, or at least Noble Medicines, in the Falling sickness, Hysterical Fits, and divers other Distempers.

Fourthly, I very well foresee it may be objected, that the Chick with all its parts is not a Mechanically contriv'd Engine, but fashion'd out of Matter by the Soul of the Bird, lodg'd chiefly in the *Cicatricula*, which by its Plastick power fashions the obsequious Matter, and becomes the Architect of its own Mansion. But not here to examine, whether any Animal, except Man, be other then a Curious Engine, I answer, that this Objection invalidates not what I intend to prove from the alledg'd Example. For let the Plastick Principle be what it will, yet still, being a Physical Agent, it must act after a Physical manner, and having no other Matter to work upon but the White of the Egg.

it can work upon that Matter but as Physical Agents, and consequently can but divide the Matter into minute parts of several Sizes and Shapes, and by Local Motion variously context them, according to the Exigency of the Animal to be produc'd, though from so many various Textures of the produc'd parts there must naturally emerge such differences of Colours, Tasts, and Consistencies, and other Qualities as we have been taking notice of. That which we are here to consider, is not what is the Agent or Efficient in these Productions, but what is done to the Matter to effect them. And though some Birds by an inbred Skill do very Artificially build their Curious Nests, yet cannot Nature, that teaches them, enable them to do any more then select the Materials of their Nests, and by Local Motion divide, transport, and connect them after a Certain manner. And when Man himself, who is undoubtedly an Intel-

ligent Agent, is to frame a Building or an Engine, he may indeed by the help of Reason and Art, contrive his Materials curiously and skilfully, but still all he can do, is but to move, divide, transpose, and context the several parts, into which he is able to reduce the Matter assign'd him.

Nor need we imagine, that the Soul of that Hen, which having first produc'd the Egg, does after a while sit on it, hath any peculiar Efficiency in hatching of a Chick: for the Egg will be well hatch'd by another Hen, though That which laid it be dead; and, which is more, we are assur'd by the Testimony of very good Authors, as well as of recent Travellers, that in some places, especially in *Agypt*, there needs no Bird at all to the Production of a Chick out of an Egg, since they hatch multitudes of Eggs by the regulated heat of Ovens, or Dunghils. And indeed, that there is a Motion or Agitation of the parts

parts of the Egg by the external heat, whereby it is hatch'd, is evident of its self, and not (as far as I know) deny'd by any, and that also the white Substance is absumed and contexted, or contriv'd into the Body of the Chick, and its several parts, is manifest to sense; especially if one hath the Curiosity to observe the progress of the Chicks Formation and Increment. But as 'tis evident, that as these two things, the Substance of the White, and the Local Motion, wherein the External Heat necessary to Incubation puts its parts, do eminently concur to the Production of the Chick; so that the Formative Power (whatever that be) doth any more then guide these Motions, and thereby associate the fitted Particles of Matter after the manner requisite to constitute a Chick, is that which I think will not easily be evinc'd. And I might to what I said of the Egg, adde several things touching the Generation of Vi-

viparous Animals, which the Learned *Fabricius ab Aqua pendente*, as well as some of the Antient Philosophers, would have to be generated from an Imperfect kind of Eggs: but I take the Eggs of Birds to be much fitter to instance in, because they are things that we have more at command, and where-with we can conveniently make more Trials and Observations; and especially because in perfect Eggs the Matter to be transmuted is more closely lock'd up, and being kept from any visible supply of Matter, confin'd to be wrought upon by the External Heat, and by its own Vital Principle within.

II.

Water being generally esteem'd an Elementary Body, and being at least far more Homogeneous then Bodies here below are wont to be; it may make very much for our present purpose to shew, that Water it self, that is Fluid, Tasteless,

Tastless, Inodorous, Diaphanous, Colourless, Volatile, &c. may, by a differing Texture of its Parts, be brought to constitute Bodies of Attributes very distant from these. This I thought might be done, by nourishing Vegetables with simple water. For in case I could do so, all, or the greatest part of that which would accrue to the Vegetable thus nourish'd, would appear to have been materially but Water, with what Exotick Quality soever it may afterwards, when transmuted, be endow'd.

The Ingenious *Helmont* indeed mentions an Experiment somewhat of this nature, though not to the same purpose, which he made by planting a Branch of Willow into a Pot full of Earth, and observing the increase of Weight he obtain'd after divers years, though he fed the Plant but with Rain water. And some Learned Modern Naturalists have conjectur'd at the easy Transmutable-ness of Water, by what happens in

Gardens and Orchards, where the same Showers or Rain after a long Drought makes a great number of differing Plants to flourish. But though these things be worthy of their Authors, yet I thought they would not be so fit for my purpose, because it may be speciously enough objected, That the Rain water does not make these Plants thrive and flourish, by immediately affording them the Aliments they assimilate into their own Substance, but by proving a Vehicle, that dissolves the Saline, and other Alimental Substances of the Earth, and dilutes both them and the nutritive Juice, which, in a part of the Plant its self, it may find too much thickned by the Drought or Heat of the ambient Air, and by this means it contributes to the nourishment of the Plant, though it self be insensibly afterwards exhal'd into vapours. And indeed Experience shews us, that several Plants, that thrive not well without Rain water, are not
yet

yet nourish'd by it alone, since when Corn in the Field, and Fruit-trees in Orchards have consum'd the Saline and Sulphureous Juices of the Earth, they will not prosper there, how much Rain soever falls upon the Land, till the Ground by Dung or otherwise be supply'd again with such assimilable Juices. Wherefore I rather chose to attempt the making of Plants grow in Viols fill'd with Water, not onely to prevent the forementioned Objection, and also to make the Experiment lesse tedious, but that I might have the pleasure of seeing the progress of Nature in the Transmutation of Water; and my Observations of this kind as Novelties, unmention'd by any other Writer, I shew'd divers Ingenious Freinds, who having better Opportunities then I of staying in one place, have attempted the like, and made succesful Trials, which; I suppose, will not be conceal'd from the publick. Of my Observations about things

things of this kind, I can at present find but few among my *Adversaria*; but in Them I find enough for my present turn. For They and my Memory inform me, that *Vinca per Vinca*, *Raphanus Aquaticus*, Spearemint, and even *Ranunculus* it self, did grow and prosper very well in Viols filld with fair water, by whose Necks the Leaves were supported, and the Plant kept from sinking: some of these were onely Cuttings without Roots, divers of them were left in the water all the Autumn, and great part of the Winter, and at the latter end of January were taken out verdant, and with fair Roots, which they had shot in the water. And besides I find, that particularly a Branch or Sprig of *Raphanus Aquaticus* was kept full nine Months, and during that time wither'd not the whole Winter, and was taken out of the water with many fibrous Roots, and some green Buds, and an increase of Weight, and that a Stump
of

of *Ranunculus* did so prosper in the water, that in a Months time it had attain'd to a pretty deale more then double the weight it had, when it was put in. And the next Note, which I find concerning these Plants, informes me, that the above mention'd Crowsfoot being taken out *agen* at six Months after it was put in, weigh'd a Drachm and a half wanting a Grain and a half, that is, somewhat above Thrice as much as it did at first. This last Circumstance (of the increase of Weight) I therefore thought fit particularly to make Trial of, and set down upon this account among others, That having doubted the Roots and Leaves, that seem'd produc'd out of the Water, might really be so, by an Oblongation and an Expansion of the Plants, (as I have purposely try'd, that an Onion weigh'd and laid up in the Spring, though after some weeks keeping in the Air it shot Blades, whereof one was five Inches long, in stead of

incor-

incorporating the Air or terrestrial *Efluviums* with it self, and consequently thereby growing heavier, had lost nine Grains of its former weight;) it might by this Circumstance appear, that there may be a real Assimilation and Transmutation of Water into the Substance of the Vegetable, as I elsewhere also shew by other proofs. For this being made out, from thence I infer, That the same Corpuscles, which, convening together after one manner, compose that fluid, Inodorous, colourless, and insipid Body of Water being contexted after other manners, may constitute differing Concretes, which may have Firmeness, Opacity, Odours, Smells, Tasts, Colours, and several other manifest Qualities, and that too very different from one another. And besides all this, these distinct Portions of Transmuted Water may have many other Qualities, without excepting those that are wont to be call'd Specifick, or Occult, witness

ness the several Medicinal Virtues attributed by Authors to Spearmint, and to Periwinkle, to Majorane, and to *Raphanus Aquaticus*. And as for *Ranunculus*, that Plant being reckoned among Poisonous ones, and among those that raise Blisters, 'twill be easily granted, that it hath, as other Poisons, an Occult Deleterial faculty; and indeed it somewhat deserves our wonder, that so insipid and innocent a thing as fair Water, should be capable to be turn'd into a Substance of such a piercing and caustick Nature, as by Contact to raise Blisters on an humane Body. And yet perhaps that is no lesse strange, which we elsewhere relate, That a Plant, consisting chiefly of Transmuted Water, did by Distillation afford us a true Oyl, that would not mingle with Water, and consequently was easily convertible into Fire. But whether or no this Experiment, or any such like, prove, that almost All things may be made of All things,

things, not immediately, but by intervention of successive Changes and Dispositions, is a Question to which we elsewhere say something, but are not willing in this place to say any thing. And if it be here objected, That the solid Substance, that accrues to a Plant rooted in Water, proceeds not at all from the water it self, but from the Nitrous, fat, and earthy Substances, that may be presum'd to abound even in common Water, not here to repeat what I elsewhere say about this Objection, I shall at present reply, That though as to divers Plants, that flourish after Raine, I am apt to think, as I intimated above, that they may in part be nourish'd as well by the Saline and Earthy Substances, to which the Rain usually proves a Vehicle, as by the Rain it self, yet as to what the Objection holds forth about the Plants, that grow not in the Ground, but in Glasses fill'd with Water, it should not be barely said but prov'd,

prov'd, which he will not perhaps think easie to be done, that considers how vast a quantity of fair Water is requisite to be exhal'd away, to obtain as much as one Ounce of dry Residents, whether Saline or Earthy.

III.

That a Plant, growing in the Earth, doth by the faculties of its Vegetative Soul attract the Juices of the Earth, that are within its reach, and selecting those parts that are congruous to its Nature, refuse the rest, is the general Opinion of Philosophers, and Physicians: and therefore many Naturalists are not wont much to marvel, when they see a Tree bear a Fruit that is sour or bitter, because they presume, that Nature hath in the Root of the Tree cull'd out such parts of the Alimental Juice of the Earth, as being made to convene into one Fruit, are fit to make it of such a Quality. But 'tis worth observing for
our

our present purpose what happens both in ordinary Graftings, and especially in that kind of Infition (taking the word in a large sense) which is commonly call'd Inoculation. For though we may presume, that the Root of a white Thorne (for Instance) may electively attract its Aliment from the Earth, and choose that which is fittest to produce the Ignoble fruit, that is proper for that Plant: yet we cannot reasonably suppose, that it should in its attraction of Aliment have any Designe of providing an Appropriate Nutriment for a Pore, and yet the known Experience of Gardiners, and our own Observations manifest, that the Cyons of a Pear tree will take very well upon a White thornstock, and bring forth a well tasted fruit, very differing in many qualities from that of the White thorn. I have also learn'd from those that are expert, That though Apples and Pears, being but Vulgar Fruit, are seldome propagated but

but by Grafting; yet they may be propagated likewise by Inoculation, (which seems to be but a kind of Grafting with a Bud.) Now in the Inoculations, that are made upon Fruit trees, tis very observable, and may much countenance what we are endeavouring to prove, that a little Vegetable Bud, (that is no Seed, properly so call'd,) not so big oftentimes as a Pea, should be able so to transmute all the Sap that arrives at it, that though this Sap be already in the Root, and in its passage upwards determin'd by Natures Intention, as Men are wont to speak, to the production of the Fruit that is natural to the Stock; yet this Sap should by so small a Vegetable Substance as a Bud, (whether by the help of some peculiar kind of Strainer, or by the Operation of some powerful Ferment lodged in it, or by both these, or some other cause,) be so far chang'd and overrul'd, as to constitute a Fruit quite otherwise qualify'd, then that

L

which

which is the Genuine production of the Tree, and which is actually produc'd by those other portions of the like Sap, which happen'd to nourish the proliſtick Buds that are the Genuine Offspring of the Stock; so that the same Sap, that in one part of a Branch constitutes (for instance) a Cluster of Haws, in another part of the same Branch may constitute a Pear. And that which is further remarkable to our present purpose, is, That not onely the Fruites made of the same Sap do often differ from one another in Shape, Bigness, Colour, Odour, Taſt, and other obvious Qualities, as well as Occult ones: but that though the Sap it self be (oftentimes) a Watery and almost Insipid Liquor, that appears to sense Homogeneous enough, and even by Distillation affords very little besides Flegme, yet this Sap is not onely convertible by Buds of several Natures into differing Fruits, but in one and the same Fruit the transmuted Sap shall

shall by differing Textures be made to exhibit very differing, and sometimes contrary Qualities. As when (for instance) a Peach bud does not onely change the Sap that comes to it into a Fruit, very differing from that which the Stock naturally produceth, but in the Skin of the Peach it must be red, in the Kernel white, and in other parts of other Colours; the Flesh of it must be fragrant, the Stone inodorous, the Flesh soft and yielding, the Stone very hard and brittle, the Meat pleasantly tasted, the Kernel bitter; not to mention, that Peach Blossoms, though produc'd also by the Bud, are of a Colour and Texture very differing from that of the Fruit, and are enobled with an Occult Quality, which the Fruit hath not, I mean a Purgative Virtue: So that from Inoculations we may learn, That a flegmatick Liquor, that seems Homogeneous enough, & but very slenderly provided with other manifest Qualities then

common water, may, by being variously contexted by the Buds of Trees, be transmuted into Bodies endow'd with new, and various, and considerable Sents, Colours, Tasts, Solidity, Medicinal vertues, and divers other Qualities manifest, and occult.

If it be here said, that these Qualities are the productions of the Plastick Power residing in prolifick Buds, which indeed (to me) seem to be but very minute Boughs; I shall return the same Answer that I did to the like Objection, when 'twas propos'd in the First Observation.

Hitherto I have onely argued from vulgar Inoculations, but there may be others, as well more considerable, as lesse ordinary; and I remember I have seen a Tree, whereof, though the Stock was of one sort of good Fruit, there were three more and differing kinds of Stone-fruit, that had been made to take by Inoculation; and two of those inocu-
lated

lated Boughs had actually Fruit on them, and the third, though it had as yet no Fruit, because the Season for that sort of Plants to bear it was not yet come, yet the Shoot was so flourishing, that we concluded, that the Blossoms would in due time be succeeded by fruit. And since I have been speaking of the differing Qualities of the parts of the same Fruit, I am content to adde two things: the one that *Garcias ab Horto*, a Classick Author, (and Physician to the Indian Viceroy) affirms * with some solemnity, (as wondering that a Learned man should write otherwise,) that though the fruit we call *Cassia fistula* be very commonly us'd, both here and in the *Indies* as a Purging Medicine, yet the Seeds of this Solutive *Cassia* are Astringent. The other: That of late years there have been often brought into England from the *Carybbe* Islands, certain Kernels of a fruit, which those

* *Aromat. Hist. lib. 1. cap. 29. de Cassia solutiva.*

that have seen it grow, liken to a white Pear-plumme ; these are so strongly Purgative, and also Emetick, that the Ingenious Mr. *Lygon* * tells us , that five of them wrought with him a Dozen times upwards, and above Twenty downwards, and yet the same Author assures us, (which is likewise here a receiv'd Tradition among them that are curious of this fruit,) That in the Kernel, in the parting of it into halves , (as when our Hazle Nuts in *England* part in the middle longwise) you shall find a thin Filme, which looks of a faint Carnation, (which colour is easily enough discerned, the rest of the Kernel being perfectly white,) and that taking out the Filme you may eat the Nut safely, without feeling any Operation at all, and 'tis as sweet as a Jordan Almond. [A Learned Man, that practis'd Physick in *America*, being inquir'd of by me concerning the Truth of this Relation,

* *Ligon's History of Barbados*. pag. 67. 68.

answer'd, That though he had divers times given those Nuts as Cathartick Remedies, yet he had not that Curiosity to take out the Filmes, finding it the Universal belief, that the Purgative faculty consisted therein. } And I remember, that the famous * *Monardes* doth somewhat countenance this Tradition, where speaking of another Purg- ing fruit, that also comes from *America*, (from *Cartagena*, and *Nombre de Dios*,) he takes notice, that these purging Beans (which are like ours, but smaller) have a thin Skin, that divides them through the middle, which must (together with the external Rind) be cast away, else they will work so violently both upwards and downwards, as to bring the Taker into hazard of his Life: whereas he commends these Beans rightly prepar'd, not onely as a pleasant Medicine, that doth without trouble

* See *Nicholaus Monardes*, under the Title, *Fabæ Purgatrices*.

purge both Choler, Flegme, and gross Humors, for which it is celebrated among the *Indians*.

To these stories of our Countrymen, and *Monardes*, I shall subjoin another, which I find related by that great Rambler about the World, *Vincent le Blanck*, who giving us an Account of a publick Garden, which he visited in *Africa*, in the Territories of the Lord of *Casima*, not far from the Borders of *Nubia*, which he represents as the curiofest Garden he saw in all the East, he mentions this among other Rarities, "There were (sayes he) other sorts of Fruit, which I never saw but there, and one among the rest leav'd like a Sycamore, with fruit like the Golden Apple, but no Gall more bitter, and within five Kernels, as big as Almonds, the Juice whereof is sweet as Sugar, betwixt the Shell and the Nut there grows a thick Skin of a Carnation colour, which

Vincent le Blanck's Survey of the World: Part. 2. p. 260.

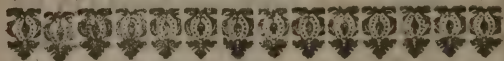
taken

taken before they be thoroughly ripe; they preserve with Date Vinegar, and make an excellent Sweetmeat, which they present to the King as a great Curiosity.

IV.

The Fourth and last Observation I shall at present mention, is afforded me by the consideration of Rotten Cheese. For if we take notice of the difference betwixt two parts of the same Cheese, whereof the one continues sound by preserving its Texture, and the other hath suffer'd that Impairing Alteration of Texture we call Rottenness, we may often see a manifest and notable Change in the several portions of a Body, that was before Similar. For the Rotten part will differ from the Sound in its *Colour*, which will be sometimes Livid, but most commonly betwixt Green and Blew; and its *Odour*, which will be both strong and offensive; and its *Tast*, which will be very Picquant, and to some men
much

much more pleasant then before, but to most men odious; and in divers other Qualities, as particularly its *Consistence*, it will be much lesse Solid and more Friable then before; and if with a good Microscope we look upon the moulded parts of many Cheeses, we shall quickly discover therein some Swarms of little Animals, (the Mites,) furnish'd with *variety* of Parts of differing Sizes, Shapes, Textures, &c. and discry a yet greater diversity, both as to manifest Qualities (nor probably is it inferior as to Occult ones) betwixt the Mouldy part of the Cheese and the Untainted, then the unassisted Eye could otherwise have discovered.



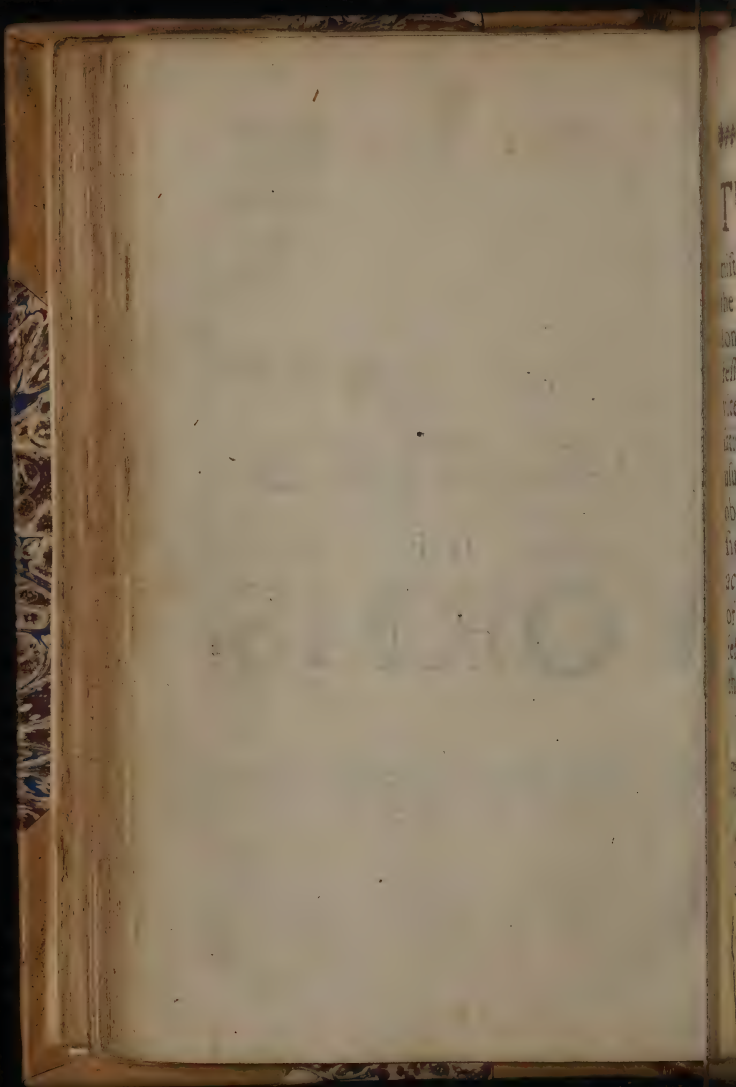
* The following Discourse (Of the Origine of Forms) ought to have been placed before this foregoing Section of the Historical Part.

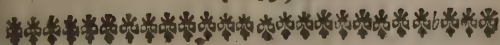
but to
other
sence,
more
good
buled
quick-
ms of
niall d
Sizes,
a yet
anifest
or as to
y part
then
e have

and
ff

Form
Sedney

OF THE
ORIGINE
OF
FORMS.





THe Origine of Forms, *Pyrophilus*, as it is thought the *Noblest*, so, if I mistake not, it hath been found one of the most *perplex'd* Enquiries, that belong to Natural Philosophy: and, I confesse, it is one of the things that has invited me to look about for some more satisfactory Account, then the Schools usually give of this matter, that I have observ'd, that the wisest that have busied themselves in explicating Forms according to the Peripatetick Notions of them, have either knowingly Confess'd themselves unable to explain them, or unwittingly Prov'd themselves

Formarum cognitio est rudis, confusa, nec nisi per exercitium; neque verum est, formæ substantialis speciem recipi in intellectum, non enim in sensu usquam fuit. J.C. Scalig.

Formæ substantiales sunt incognitæ nobis, quia insensibiles: ideo per qualitates, quæ sunt principia immediata Transmutationis, exprimuntur. Aquinas ad 1. de generat. & corrupt.

In hac humanæ mentis caligine æquæ forma Ignis ac Magnetis nobis ignota est. Sennertus,

to

to be so, by giving but unsatisfactory
Explications of them:

It will not (I presume) be expected,
that I, who now write but *Notes*, should
enumerate, much lesse examine all the
various Opinions touching the Origine
and Nature of Forms; it being enough
for our purpose, if, having already inti-
mated in our *Hypothesis*, what, accor-
ding to that, may be thought of this
Subject; we now briefly consider the
general Opinion of our Modern *Aristo-
telians* and the Schools concerning it.
I say, the *Modern Aristotelians*, because
diverse of the *Antient*, especially *Greek*
Commentators of *Aristotle*, seem to
have understood their Masters Doctrine
of Forms much otherwise, and lesse in-
congruously, then his Latin followers,
the Schoolmen and others, have since
done. Nor do I expressly mention *Ari-
stotle* himself among the Champions of
substantial Forms, because though he
seem in a place or two expressly enough
to

to reckon *Formes* among *Substances*, yet elsewhere the Examples he imployes to set forth the *Forms* of Natural things by, being taken from the *Figures* of artificial things, (as of a Statue, &c.) which are confessedly but *Accidents*, and making very little use, if any, of Substantial *Forms* to explain the *Phænomena* of Nature, He seems to me upon the whole matter, either to have been irresolv'd, whether there were any such Substances, or no, or to speak ambiguously and obscurely enough of them, to make it questionable, what his Opinions of them were.

But the summe of the Controversy betwixt Us and the Schools is this, whether or no the *Forms* of Natural things, (the Souls of Men alwaies excepted) be in Generation *educed*, as they speak, *out of the power of the Matter*, and whether these *Forms* be true *substantial Entities*, distinct from the other substantial Principle of Natural Bodies, namely Matter. The

The Reasons that move me to embrace the Negative, are principally these three. *First*, That I see no necessity of admitting in Natural things any such substantial Forms, Matter and the Accidents of Matter being sufficient to explicate as much of the *Phænomena* of Nature, as we either do or are like to understand. *The next*, That I see not what use this puzzling Doctrine of substantial Forms is of in Natural Philosophy; the Acute *Scaliger*, and those that have most busied themselves in the Indagation of them, having freely acknowledged, (as the more Candid of the Peripateticks generally do,) That the true Knowledge of Forms is too difficult and abstruse to be attain'd by them. And how like it is, that particular *Phænomena* will be explain'd by a Principal, whose Nature is confessedly ignor'd, I leave you to judg: but because to these considerations I often have had, and shall have here and there occasion to say

say something in the body of these Notes, I shall at present insist upon the *third*; which is, That I cannot conceive, neither how Forms can be generated, as the Peripatericks would have it, nor how the things, they ascribe to them, are consistent with the Principles of true Philosophy, or even with what themselves otherwise teach.

The Manner how Forms are educed out of the Power of the Matter, according to that part of the Doctrine of Forms, wherein the Schools generally enough agree, is a thing so Inexplicable, that I wonder not it hath put Acute men upon several *Hypotheses* to make it out. And indeed the number of These is of late grown too great to be fit to be here recited, especially since I find them all so very unsatisfactory, that I cannot but think, the acute Sticklers for any of them are rather driven to embrace it by the palpable inconveniences of the wayes they reject, then by any thing

M

they

they find to satisfy them, in that which they make choice of: and for my part I confess, I find so much Reason in what each Party sayes against the Explications of the rest, that I think they all Confute well, and none does well Establissh.

But my present way of Writing forbidding me to insist on many Arguments against the Doctrine, wherein they most agree, I shall onely urge, That which I confess chiefly sticks with me, namely that I find it not *Comprehensible*.

I know the Modern Schoolmen fly here to their wonted Refuge of an Obscure Distinction, and tell us, that the Power of Matter in reference to Forms is partly Eductive, as the Agent can make the Form out of it, and partly Receptive, whereby it can receive the Form so made; but since those that say this, will not allow, that the Form of a generated Body was actually præexistent in its Matter, or indeed any where else,

'tis hard to conceive, how a Substance can be educ'd out of another Substance totally distinct in Nature from it, without being, before such Education, actually existent in it. And as for the Receptive Power of the Matter, That but fitting it to receive or lodge a Form, when brought to be United with it, how can it be intelligibly made out to contribute to the Production of a new Substance, of a quite differing Nature from that Matter, though it harbours it when produc'd? And 'tis plain, that the Humane Body hath a receptive Power in reference to the Humane Soule, which yet themselves confess both to be a substantial Form, and not to be educ'd out of the Power of Matter. Indeed if they would admit the Form of a Natural Body to be but a more fine and subtle part of the Matter, as Spirit of Wine is of Wine, which upon its recess remains no longer Wine, but Flegm or Vinegar, then the Eductive Power of Matter

M 2

might

might signifie something ; and so it might, if with us they would allow the Form to be but a Modification of the Matter; for then it would import but that the Matter may be so order'd or dispos'd by fit Agents, as to constitute a Body of such a sort and Denomination: and so (to resume that Example) the Form of a Sphære may be said to lurk potentially in a piece of Brass, in as much as that Brass may by casting, turning, or otherwise, be so figur'd as to become a Sphære. But *this* they will not admit, least they should make Forms to be but Accidents, though it is for ought I know as little intelligible, how what is educ'd out of any Matter, without being either præexistent, or being any part of the Matter, can be a true Substance, as how that Roundness, that makes a piece of Brass become a Sphere, can be a new Substance in it. Nor can they admit the *other way* of educing a Form out of Matter, as Spirit is out of Wine,

Wine, because then not onely Matter will be corruptible against their grounds, but Matter and Form would not be two differing and substantial Principles, but one and the same, though diversify'd by firmness, and grosseness, &c. which are but Accidental differences. I know they speak much of the efficacy of the Agent upon the Matter, in the Generation of Natural Bodies, and tell us strange things of his manner of working. But not to spend time in examining those obscure niceties, I answer in short; That since the Agent, be he what he will, is but a Physical and finite Agent, and since what way soever he works, he can do nothing repugnant to the nature of things, the difficulty, that sticks with me, will still remain. For if the Form produc'd in Generation, be, as they would have it, a Substance, that was not before to be found any where out of that portion of Matter, wherewith it

constitutes the Generated Body; I say that either it must be produc'd, by refining or subtiliating some parts of the Matter into Form, or else it must be produc'd out of nothing, that is, Created, (for I see no Third way, how a Substance can be produc'd *de novo*.) If they allow the First, then will the Form be indeed a Substance, but not, as they hold it is, distinct from Matter; since Matter, however subtiliated, is Matter still, as the finest Spirit of Wine is as truly a Body, as was the Wine it self, that yeilded it, or as is the Grosser Flegm, from which it was extracted: besides that, the Peripateticks teach, that the Form is not made of any thing of the Matter; nor indeed is it conceivable, how a Physical Agent can turn a Material into an Immaterial Substance, especially Matter being, as they themselves confesse, as well incorruptible as ingenerable. But if they will not allow, as indeed they do not, that the substantial Form is made
of

of any thing that is Material, they must give me leave to believe, that tis produc'd out of Nothing, till they shew me, how a Substance can be produc'd otherwise, that existed no where before. And at this rate every Natural Body of a special Denomination, as Gold, Marble, Nitre, &c. must not be produc'd barely by Generation, but partly by Generation, and partly by Creation. And since tis confess'd on all sides, that no Natural Agent can produce the least Atome of Matter, tis strange they should in Generation allow every Physical Agent the power of producing a Form, which, according to them, is not onely a Substance, but a far nobler one then Matter, and thereby attribute to the meanest Creatures that power of creating Substances, which the Antient Naturalists thought too great to be ascrib'd to God himself, and which indeed is too great to be ascrib'd to any other then Him, and therefore some Schoolmen

and Philosophers have deriv'd Forms immediately from God; but this is not onely to desert *Aristotle* and the Peripatetick Philosophy they would seem to maintain, but to put Omnipotence upon working I know not how many thousand Miracles every hour, to performe that (I mean the Generation of Bodies of new Denominations) in a supernatural way, which seems the most familiar effect of Nature in her ordinary course.

And as the Production of Forms out of the Power of Matter is for these Reasons incomprehensible to me, so those things, which the Peripateticks ascribe to their substantial Forms, are some of them such, as, I confesse, I cannot reconcile my Reason to: for they tell us positively, that these Forms are Substances, and yet at the same time they teach, that they depend upon Matter, both *in fieri* and *in esse*, as they speak, so that out of the Matter, that supports them, they

they cannot so much as exist, (whence they are usually call'd Material Forms,) which is to make them Substances in name, and but Accidents in truth: for not to ask how (among Physical things) one Substance can be said to depend upon another *in fieri*, that is not made of any part of it, the very notion of a Substance is to be a self-subsisting Entity, or that which needs no other Created Being to support it, or to make it exist. Besides that, there being but two sorts of Substances, Material, and Immaterial, a substantial Form must appertain to one of the two, and yet they ascribe things to it, that make it very unfit to be referr'd to either. To all this I adde, that these imaginary Material Forms do almost as much trouble the Doctrine of Corruption, as that of Generation: for if a Form be a true Substance really distinct from Matter, it must, as I lately noted, be able to exist of it self, without any other Substance to support it;

as those I reason with confess, that the Soul of Man survives the Body, it did before Death inform: whereas they will have it, that in Corruption the Form is quite abolish'd, and utterly perishes, as not being capable of existing, separated from the Matter, whereunto it was united: so that here again, what they call a Substance they make indeed an Accident, and besides contradict their own vulgar Doctrine, That Natural things are upon their Corruption resolv'd into the first Matter, since at this rate they should say, that such things are but partly resolv'd into the first Matter, and partly either into Nothing, or into Forms, which being as well immaterial as the Souls of Men, must, for ought appears, be also, like them, accounted immortal.

I should now examine those Arguments, that are wont to be imploy'd by the Schools to evince their substantial Forms, but, besides that the nature and scope

scope of my present Work injoyes me Brevity, I confesse that, one or two execepted, the Arguments I have found mention'd, as the chief, are rather Metaphysical, or Logical, then groundd upon the Principles and *Phænomena* of Nature, and respect rather Words then Things, and therefore I, who have neither inclination, nor leasure, to wrangle about Terms, shall content my self to propose, and very briefly answer two or three of those that are thought the plausiblest.

First then they thus argue. *Omne Compositum substantiale* (for it is hard to English well such Uncouth Terms) *requirit materiam & formam substantialem, ex quibus componatur. Omne corpus naturale est compositū substantiale. Ergo* &c. In this Syllogisme some do plausibly enough deny the Consequence, but for brevities sake, I shall rather choose to deny the Minor, and desire the Proposers to prove it. For I know
not

not any thing in Nature that is compos'd of Matter, and a Substance distinct from Matter, except Man, who alone is made up of an immaterial Form, and a humane Body; and if it be urg'd, that then other Bodies cannot be properly said to be *Composita substantialia*: I shall, rather then wrangle with them, give them leave to find out some other name for other Natural things.

But then they argue in the next place, that, if there were no substantial Forms, all Bodies would be but *Entia per accidens*, as they speak, which is absurd. To which I answer, That in the Notion, that divers Learned men have of an *Ens per Accidens*, namely, that tis That which consists of those things, *quæ non ordinantur ad unum*, it may be said, That though we do not admit substantial Forms, yet we need not admit Natural Bodies to be *Entia per accidens*; because in them the several things that concur to constitute the Body, as Matter, Shape,

Shape, Scituation, and Motion, *ordinantur per se & intrinsecè* to constitute one Natural Body. But, if this Answer satisfie not, I shall adde, that for my part, That which I am solicitous about, is, what Nature hath made things to be in themselves, not what a Logician or Metzphysician will call them in the Terms of his Art; it being much fitter in my judgment to alter Words, that they may better fit the Nature of Things, then to affix a wrong Nature to Things, that they may be accommodated to forms of Words, that were probably devis'd, when the things themselves were not known or vvell understood, if at all thought on.

Wherefore I shall but adde one Argument more of this sort, and That is, that, if there vvere no substantial Forms, neither could there be any substantial Definitions, but the Consequent is absurd, and therefore so is the Antecedent. To vvhich I reply, that since the Peripateticks

pateticks themselves confess the Forms of Bodies to be of themselves unknown, all that this Argument seems to me to conclude, is but this, *That* if we do not admit somethings, that are not *in rerum natura*, we cannot build our Definitions upon them: nor indeed could we, if we should admit substantial Forms, give substantial Definitions of Natural things, unlesse we could also define Natural Bodies by things that we know not; for such * the substantial Forms are (as we have seen already) confess'd to be, by the wisest Peripateticks, who pretend not to give the substantial Definition of any Natural *Compositum*, except Man. But it may suffice Us to have, instead of *substantial*, *essential* Definitions of things; I mean such as are taken from the Essential Differences of things, which constitute them in such a sort of Natural Bodies, and discriminate

* *Nego tibi ullam esse formam nobis notam plenè & planè, nostramq; scientiam esse umbram in Sole. Scalig.*

them from all those of any other sort:

These three Arguments, *Pyrophilus*, for substantial Forms, You may possibly, as well as I, find variously propos'd, and perhaps with some light alterations multiply'd in the writings of the Peripateticks and Schoolmen; but all the Arguments of this kind that I have met with, may, if I mistake not, be sufficiently solv'd by the Answers we have given to these, or at least by the grounds upon which those Answers are built; those seemingly various Arguments agreeing in this, That *either* they respect rather Words than Things, *or* that they are grounded upon precarious Suppositions; *or* lastly that they urge That as an Absurdity, which, whether it be one or not in those, that admit the Peripatetick Philosophy, to me, that do as little acquiesce in many of their other Principles, as I do in their substantial Forms, doth not appear any Absurdity at all. And tis perhaps for fear that Arguments

ments of this sort should not much prevaile with Naturalists, that some of the Modern assertors of the Forms we question, have thought it requisite to addc some more Physical Arguments, which (though i have not found them all in the same Writers, yet) being in all but few, I shall here briefly consider them.

First then among the Physical Arguments, that are brought to prove substantial Forms, I find That the most confidently insisted on, which is taken from the spontaneous return of heated Water to Coldness, which Effects, say they, must necessarily be ascrib'd to the Action of the substantial Form, whose office it is to preserve the Body in its Natural state, and, when there is occasion, to reduce it thereunto: and the Argument indeed might be plausible, if we were sure, that heated Water would grow cold again (without the Avolation of any Parts more agitated then the rest,) supposing it to be remov'd into
some

Some of the imaginary spaces beyond the World; but as the case is, I see no necessity of flying to a substantial Form, the Matter seeming to be easily explicable otherwise. The Water we heat is surrounded with our Air, or with some Vessel, or other Body contiguous to the Air, and both the Air and the Water in these Climates are most commonly lesse agitated, then the Juices in our hands, or other Organs of Touching, which makes us esteem and call those Fluids, cold. Now when the Water is expos'd to the fire, it is thereby put into a new Agitation, more vehement then that of the parts of our Sensory, which you will easily grant, if you consider, that when the Heat is intense, it makes the Water boyl and smoak, and oftentimes run over the Vessel; but when the Liquor is remov'd from the fire, this acquir'd Agitation must needs by degrees be lost, *either* by the avolation of such fiery Corpuscles as the

Epicureans imagine to be got into heated Water, *or* by the Water's communicating the Agitation of its Parts to the contiguous Air, *or* to the Vessel that contains it, till it have lost its surplusage of Motion, *or* by the ingress of those frigorifick Atoms, wherewith (if any such be to be granted) the Air in these Climates is wont to abound, and so be reduc'd into its former Temperature: which may as well be done without a substantial Form, as if a Ship swimming slowly down a River, should by a sudden gust of Wind, blowing the same way the Stream runs, be driven on much faster then before, the Vessel upon the ceasing of the Wind may, without any such internal principle, return after a while to its former slowness of Motion. So that in this *Phænomenon*, we need not have recourse to an internal principle, the Temperature of the external Air being sufficient to give an account of it. And if Water be kept, (as is usual

sual in poor mens houses that want Cellars,) in the upper Rooms of the house, in case the Climate be hot, the Water will, in spite of the Form, continue far less cold, then, according to the Peripateticks, its nature requires, all the Summer long. And let me here represent to the Champions of Forms, that, according to their Doctrine, the Fluidity of Water, must at least as much proceed from its Form as the Coldness, and yet this does so much depend upon the Temperature of the Air, that in *Nova Zembla* vast quantities of Water are kept in the hard and solid Form of Ice all the year long, by the sharp Cold of the ambient Air, notwithstanding all the pretended Office and Power of the substantial Form to keep it fluid, which it will never be reduc'd to be, unless by such a thawing Temperature of the Air, as would it self, for ought appears, make it flow again, although there were no substanti-

al Form *in rerum natura*.

There is another Argument much urg'd of late by some Learned Men, the substance whereof is this; That Matter being indifferent to one sort of Accidents as well as to another, it is necessary there should be a substantial Form, to keep those Accidents, which are said to constitute it, united to the Matter they belong to, and preserve both them and the Body in their Natural state; for since tis confess'd, that Matter hath no appetite to these Accidents, more then to any others, they demand, how without a substantial Form these Accidents can be contain'd and preserv'd? To this I might represent, that I am not so well satisfy'd with the Notion wont to be taken for granted, not onely by the vulgar, but by Philosophers, of the Natural state of Bodies; as if it were undeniable, that every Natural Body, (for as to some, I shall not *now* question it,) has a certain state, wherein Nature endeavours

deavours to preserve it, and out of which it cannot be put, but by being put into a Præternatural state. For the World being once constituted by the great Author of Things, as it now is, I look upon the *Phænomena* of Nature to be caus'd by the Local Motion of one part of Matter hitting against another, and am not so fully convinc'd, that there is such a thing, as Natures designing to keep such a parcel of Matter in such a state, that is cloth'd with just such Accidents, rather than with any other. But I look upon many Bodies, especially fluid ones, as frequently changing their state, according as they happen to be more or lesse agitated, or otherwise wrought upon by the Sun, and other considerable Agents in Nature. As the Air, Water, and other Fluids, if the temperature as to Cold or Heat, and Rarefaction or Condensation, which they are in at the beginning of the Spring here at *London*, be pitcht upon as their Natural state,

then not onely in the torrid and frozen Zones they must have other and very differing Natural states, but here it self they will, almost all the Summer and all the Winter, as our Weather Glasses inform us, be in a varying Præternatural state, because they will be in those seasons either more hot and rarify'd, or more cold and condens'd, then in the beginning of the Spring. And in more stable and constant Bodies I take, in many cases, the Natural state to be but either *the most usual state*, or *That, wherein that, which produces a notable Change in them, finds them*. As when a slender piece of Silver, that is most commonly flexible, and will stand bent every way, comes to be well hammer'd, I count that Flexibility to be the Natural state of that Mettal, because most commonly Silver is found to be flexible, and because it was so before it was hammer'd; but the Springinesse it acquires by hammering is a state, which is properly no more

more unnatural to the Silver then the other, and would continue with the Mettal as long as It, if both pieces of Silver, the one flexible, the other springy, were let alone, and kept from outward violence: And as the Silver, to be depriv'd of its flexibleness, needed the violent Motion of the Hammer, so to deprive it of its Spring, it needs the violent Agitation of a nealing fire. These things, and much more, I might here represent, but to come close to the Objection, I Answer, That the Accidents spoken of are introduced into the Matter by the Agents or Efficient Causes, whatever they be, that produce in it what, in the sense formerly explain'd, we call an *essential* (though not a *substantial*) Form. And these Accidents being once thus introduc'd into the Matter, we need not seek for a new substantial Principle to preserve them there, since by the general law, or common course of Nature, the Matter qualify'd by

N 4

them,

them, must continue in the state such Accidents have put it into, till, by some Agent or other, it be forcibly put out of it, and so divested of those Accidents, as in the formerly mention'd Example, borrow'd from *Aristotle*, of a Brazen Sphære, when once the Motion of Tools, impell'd and guided by the Artificer, have turn'd a piece of Brass into a Sphære, there needs no new Substance to preserve that round figure, since the Brasse must retain it, till it be destroy'd by the Artificer himself, or some other Agent able to overcome the resistance of the Matter, to be put into another figure. And on this occasion let me confirme this *ad hominem*, by representing, That there is not an inconsiderable Party among the Peripateticks themselves, who maintain, That in the Elements the First Qualities (as they call them) are instead of Forms, and that the Fire (for instance) hath no other Form then Heat and Drynesse, and the
 Wa-

Water then Coldnesse and Moisture.
 Now if these Bodies, that are the vast-
 est and the most important of the Sub-
 lunary World, consist but of the Uni-
 versal Matter, and the few Accidents;
 and if in these there needs no substanti-
 al Form to keep the Qualities of the
 Matter united to it, and conjoyn'd a-
 mong themselves, and preserve them
 in that state, as long as the Law of Na-
 ture requires, though besides the four
 Qualities that are call'd *First*, the Ele-
 ments have divers others, as Gravity
 and Levity, Firmnesse and Fluidity,
 Opacousnesse and Transparency, &c.
 why should the favourers of this Opini-
 on deny, That, in other Bodies besides
 the Elements, Qualities may be pre-
 serv'd and kept united to the Matter
 they belong to, without the Band or
 Support of a substantial Form? And as,
 when there is no competent destructive
 Cause, the Accidents of a Body will by
 the Law of Nature remain such as they
 were;

were, so if there be, it cannot with reason be pretended, that the substantial Form is able to preserve all those Accidents of a Body, that are said to flow from it, and to be as it were under its care and tuition; for if, for instance, you expose a Sphære or Bullet of Lead to a strong fire, it will quickly loose (not to mention its Figure) both its Coldness, its Consistence, its Malleableness, its Colour, (for 'twill appear of the colour of fire,) its Flexibility, and some other Qualities, and all this in spite of the imaginary substantial Form, which, according to the Peripatetical Principles, in this case must still remain in it without being able to help it. And though upon the taking the Lead from off the fire, it is wont to be reduc'd to most of its former Qualities, (for it will not of it self recover its Sphæricity,) yet That may well be ascrib'd partly to its peculiar Texture, and partly to the Coldness of the ambient Air, according to what we lately

lately discours'd touching heated and refrigerated Water, which Temperature of the Air is an extrinsecal thing to the Lead, and indeed it is but Accidental, that the Lead upon refrigeration regains its former Qualities; for in case the Lead have been expos'd long enough to a sufficiently intense fire, it will (as we have purposely try'd) be turn'd into Glasle, and loose its colour, its opacity, its malleableness, and (former degree of) flexibility, and acquire a Reddishness, a degree of Transparency, a Brittleness, and some other Qualities, that it had not before: and let the supposed substantial Form do what it can, even when the Vessel is remov'd from the fire, to reduce or restore the Body to its Natural state and Accidents, yet the former Qualities will remain lost, as long as these Præternatural ones, introduc'd by the fire, continue in the Matter; and neither the one will be restor'd, nor the other destroy'd, till some sufficiently power-

powerful extrinſick Agent effect the Change. And on the other ſide I conſider, that the Fruit, when ſever'd from the Tree it grew on, is confeſſ'd to be no longer animated (at leaſt the Kernels or Seeds excepted) by the Vegetative Soul, or ſubſtantial Form of the Plant; yet in an Orange or Lemmon (for inſtance) pluckt from the Tree, we ſee, that the ſame Colour, the ſame Odour, the ſame Taſt, the ſame Figure, the ſame Conſiſtence, and, for ought we know, the ſame other Qualities, whether ſenſible, or even occult, as are its Antidotal and Antiſcorbutical virtues, that muſt before be ſaid to have flow'd from the Soul of the Tree, will continue, many months, perhaps ſome years, after the fruit has ceaſ'd to have any commerce with the Tree, (nay though the Tree, whereon it grew, be perhaps in the mean time hewn down or burnt, and though conſequently its Vegetative Soul or Form be deſtroy'd,) as when it
grew

grew therèon, and made up one Plant with it. And we find, that Tamarinds, Rhubarb, Senna, and many other Simples will for divers years, after they have been depriv'd of their former Vegetative Soul, retain their Purgative and other Specifick properties.

I find it likewise urg'd, that there can be no Reason, why Whiteness should be separable from a Wall, and not from Snow or Milk; unlesse we have recourse to substantial Forms. But in case men have agreed to call a thing by such a name, because it has such a particular Quality, that differences it from others, we need go no farther to find a Reason, why one Quality is essential to one thing, and not to another. As in our former example of a Brass Sphære, the Figure is that, for which we give it that Name, and therefore, though you may alter the figure of the Matter, yet by that very alteration the Body perishes in the capacity of a Sphære, whereas its
Cold-

Coldness may be exchange'd for Heat, without the making it the less a Sphære, because tis not for any such Quality, but for Roundness, that a Body is said to be a Sphære. And so Firmness is an inseparable Quality of Ice, though this or that particular Figure be not, because that tis for want of fluidity, that any thing, that was immediately before a Liquor, is call'd Ice; and congruously hereunto, though Whiteness were inseparable from Snow and Milk, yet that would not necessarily infer, that there must be a substantial Form to make it so: for the Firmness of the Corpuscles, that compose Snow, is as inseparable from it, as the Whitenesse; and yet is not pretended to be the effect of the substantial Form of the Water, but of the excelsse of the Coldness of the Air, which (to use vulgar, though perhaps unaccurate, expressions,) puts the Water out of its Natural state of Fluidity, and into a Præternatural one
of

Firmness and Brittleness. And the reason, why Snow seldome looses its whiteness but with its nature, seems to be, that its component Particles are so dispos'd, that the same heat of the ambient Air, that is fit to turn it into a transparent Body, is also fit to make it a fluid one, which when it is become, we no longer call it Snow, but Water; so that the Water looses its whiteness, though the Snow do not. But if there be a cause proper to make a convenient alteration of Texture in the Snow, without melting or resolving it into water, it may then exchange its Whiteness for Yellowness, without loosing its right to be call'd Snow; as, I remember, I have read in an eminent Writer, that *de facto* in the Northern Regions towards the Pole, those parcels of Snow, that have lain very long on the ground, degenerate in time into a Yellowish colour, very differing from that pure Whiteness to be observ'd in the neighbouring Snow

Snow lately fallen.

But there yet remains an Argument for substantial Forms, which though (perhaps because Physical) wont to be overlook'd, or slightly answer'd by their Opposers, will for the same reason deserve to be taken notice of here; and it is, That there seems to be a necessity of admitting substantial Forms in Bodies, that from thence we may derive all the various changes, to which they are subject, and the differing Effects they produce, [the Preservation and Restitution of the State requisite to each particular Body, as also the keeping of its several parts united into one *Totum*. To the answering of this Argument, so many things will be found applicable, both in the past and subsequent parts of these Notes, that I shall at present but point the chief particulars, on which the Solution is grounded.

I consider then first, that many and great Alterations may happen to Bodies,

dies, which seem manifestly to proceed from their peculiar Texture, and the Action of outward Agents upon them, and of which it cannot be shewn, that they would happen otherwise, though there were no substantial Forms *in rerum natura*: as we see that Tallow (for instance) being melted by the fire looses its Coldness, Firmness, and its Whiteness, and acquires Heat, Fluidity, and some Transparency, all which, being suffer'd to cool, it presently exchanges for the three first nam'd Qualities. And yet divers of these Changes are plainly enough the effects partly of the Fire, partly of the ambient Air, and not of I know not what substantial Form: and it is both evident and remarkable, what great variety of changes in Qualities, and Productions of new ones, the Fire (that is, a Body consisting of insensible parts, that are variously and vehemently mov'd) doth effect by its Heat, that is, *by a modify'd Local Motion*. I consider
O further,

further, that various Operations of a Body may be deriv'd from the peculiar Texture of the Whole, and the Mechanical Affections of the particular Corpuscles or other parts that compose it, as we have often occasion to declare here and there in this Treatise; and particularly by an Instance, ere long to be further insisted on, namely, that though Vitriol, made of Iron with a Corrosive liquor, be but a factitious Body, made by a convenient apposition of the small parts of the saline Menstruum to those of the Metall, yet this Vitriol will do most, if not all, of the same things, that Vitriol, made by Nature in the bowels of the Earth, and digg'd out thence, will perform; and each of these Bodies may be endow'd with variety of differing Qualities, which I see not, why they must flow, in the native Vitriol, from a substantial Form, since in the factitious Vitriol, the same Qualities belong to a Form, that does plainly emerge from the

the coalition of Metalline and Saline Corpuscles, associated together and dispos'd of after a certain manner.

And lastly, as to what is very confidently, as well as plausibly, pretended, That a substantial Form is requisite to keep the parts of a Body united, without which it would not be one Body. I answer, That the contrivance of conveniently figur'd parts, and in some cases their juxtaposition, may without the assistance of a substantial Form be sufficient for this matter; for not to repeat what I just now mention'd concerning Vitriol made by Art, whose Parts are as well united and kept together, as those of the Native Vitriol, I observe, that a Pear grafted upon a Thorn, or a Plum inoculated upon an Apricock, will bear good fruit, and grow up with the Stock, as though they both made but one Tree, and were animated but by the same common Form; whereas indeed both the Stock and the inoculated or

grafted Plant have each of them its own Form, as may appear by the differing leaves, and fruits, and seeds they bear. And that which makes to our present purpose is, that even Vegetation and the Distribution of Aliments are in such cases well made, though the nourish'd parts of the Total Plant, if I may so call it, have not one common Soul or Form, which is yet more remarkable in the Mistletoes, that I have seen growing upon old Hazletrees, Crab-trees, Apple-trees, and other plants, in which the Mistletoe often differs very widely from that kind of Plant on which it grows and prospers. And for the durableness of the Union betwixt Bodies, that a substantial Form is not requisite to procure it, I have been induc'd to think by considering, that Silver and Gold, being barely mingl'd by Infusion, will have their minute parts more closely united, then those of any Plant or Animal that we know of. And there is scarce any

Natural Body, wherein the Form makes so strict, durable, and indissoluble an Union of the parts it consists of, as that, which, in that Factitious Concrete we call Glass, arises from the bare commixture of the Corpuscles of Sand with those Saline ones, wherewith they are colligated by the violence of the fire: and the like may be said of the Union of the proper Accidents of Glasse with the Matter of it, and betwixt one another.

To draw towards a Conclusion, I know tis alledg'd as a main Consideration on the behalf of substantial Forms, that these being in Natural Bodies the true principles of their Properties, and consequently of their Operations, their Natural Philosophy must needs be very imperfect and defective, who will not take in such Forms: but for my part I confess, that this very consideration does rather indispose then incline me to admit them. For if indeed there were

in every Natural Body such a thing as a substantial Form, from which all its Properties and Qualities immediately flow, since we see that the Actions of Bodies upon one another are for the most part (if not all) immediately perform'd by their Qualities or Accidents, it would scarce be possible to explicate very many of the explicable *Phænomena* of Nature, without having recourse to Them; and it would be strange, if many of the abstruser *Phænomena* were not explicable by them onely. Whereas indeed almost all the rational Accounts to be met with of difficult *Phænomena*, are given by such as either do not *acknowledge*, or at least do not *take notice* of substantial Forms. And tis evident by the clear Solutions (untouch'd by many vulgar Philosophers,) we meet with of many *Phænomena* in the Staticks, and other parts of the Mechanicks, and especially in the Hydrostaticks, and Pneumaticks, how clearly many *Phænomena* may

may be solv'd, without imploying a substantial Form. And on the other side, I do not remember, that either *Aristotle* himself, (who perhaps scarce ever attempted it,) or any of his Followers, has given a solid and intelligible solution of any one *Phænomenon* of Nature by the help of substantial Forms; which you need not think it strange I should say, since the greatest Patrons of Forms acknowledg their Nature to be * unknown to Us, to explain any Effect by a substantial Form, must be to declare (as they speak) *ignotum per ignotius*, or at least *per aequè ignotum*. And indeed to explicate a *Phænomenon*, being to deduce it from something else in Nature more known to Us, then the thing to be explain'd by It, how can the imploying of Incomprehensible (or at least Uncomprehended) substantial Forms help Us to explain intelligibly This or

* *Nomina tu lapidis, qui quotidie tuis oculis observatur, formam, & Phyllida solus habeto. Scal. contra Card.*

That particular *Phenomenon*? For to say, that such an Effect proceeds not from this or that Quality of the Agent, but from its substantial Form, is to take an easie way to resolve all difficulties in general, without rightly resolving any one in particular; and would make a rare Philosophy, if it were not far more easie then satisfactory: for if it be demanded, why Jet attracts Straws, Rhubarb purges Choller, Snow dazles the Eyes rather then Grassie. &c. to say, that these and the like Effects are perform'd by the substantial Forms of the respective Bodies, is at best but to tell me, what is the Agent, not how the Effect is wrought; and seems to be but such a kind of general way of answering, as leaves the curious Enquirer as much to seek for the *causes* and *manner* of particular Things, as Men commonly are for the particular causes of the several strang Things perform'd by Witchcraft, though they be told, that tis some Di-
vel

vel that does them all. Wherefore I do not think, but that Natural Philosophy, without being for That the more Defective, may well enough spare the Doctrine of Substantial Forms as an useless Theory; not that Men are yet arriv'd to be able to explicate all the *Phænomena* of Nature without them, but because, whatever we cannot explicate without them, we cannot neither intelligibly explicate *by* them.

And thus, *Pyrophilus*, I have offer'd You some of those many things, that indispos'd me to acquiesce in the receiv'd Doctrine of Substantial Forms; but in case any more piercing Enquirer shall perswade himself, that he understands it thoroughly, and can explicate it clearly, I shall congratulate him for such happy Intellectuals, and be very ready to be inform'd by him. But since what the Schools are wont to teach of the Origine and Attributes of substantial Forms, is that, which, I confess, I cannot

not yet comprehend; and since I have some of the eminentest Persons among the Modern Philosophers to joine with me, though perhaps not for the same Considerations, in the like confession, that tis not necessary the Reason of my not finding this Doctrine conceivable, must be rather a Defectiveness in my Understanding, then the unconceivable nature of the thing it self: I, who love not (in matters purely Philosophical) to acquiesce in what I do not understand, nor to go about to explicate things to others, by what appears to me it self inexplicable, shall, I hope, be excus'd, if, leaving those that contend for them, the liberty of making what use they can of substantial Forms, I do, till I be better satisfied, decline imploying them my self, and endeavour to solve those *Phænomena*, I attempt to give an account of, without them, as not scrupling to confess, that those that I cannot explicate, at least in a general way, by intelligible principles,

principles, I am not yet arriv'd to the distinct and particular knowledg of.

Now for our Doctrine touching the Origine of Forms, it will not be difficult to collect it from what we formerly discours'd about Qualities and Forms together: for the Form of a Natural Body, being according to us, but an Essential Modification, and, as it were, the *Stamp* of its Matter, or such a convention of the Bigness, Shape, Motion (or Rest,) Scituation and Contexture, (together with the thence resulting Qualities) of the small parts that compose the Body, as is necessary to constitute and denominate such a particular Body; and all these Accidents being producible in Matter by Local Motion, tis agreeable to our *Hypothesis* to say, That the first and Universal, though not immediate cause of Forms is none other but God, who *put Matter into Motion*, (which belongs not to its Essence,) and *Establish'd the Laws of Motion* amongst Bodies,

Bodies, and also, according to my Opinion, *guided it in divers cases at the beginning of Things*; and that, among Second Causes, the Grand Efficient of Forms is *Local Motion*, which by variously dividing, sequestering, transposing, and so connecting the parts of Matter, produces in them those Accidents and Qualities, upon whose account the portion of Matter they diversifie comes to belong to this or that determinate *species* of Natural Bodies, which yet is not so to be understood, as if *Motion* were onely an Efficient cause in the Generation of Bodies, but very often (as in water, fire, &c.) tis also one of the chiefe *Accidents*, that concurre to make up the Form.

But in this last Summary Account of the Origine of Forms, I think my self oblig'd to declare to you a little more distinctly, what I just now intimated to be my own Opinion. And this I shall do, by advertising you, that though I agree

agree with our *Epicureans*, in thinking it probable, that the World is made up of an innumerable multitude of singly insensible Corpuscles, endow'd with their own Sizes, Shapes, and Motions; and though I agree with the *Cartesians*, in believing (as I find that * *Anaxagoras* did of Old,) that Matter hath not its Motion from its self, but Originally from God; yet in This I differ both from *Epicurus* and *Des Cartes*, that, whereas the former of them plainly denies, that the World was made by any Deity, (for Deities he own'd,) and the Latter of them, for ought I can find in his Writings, or those of some of his Eminentest Disciples, thought, that God, having once put Matter into Motion, and establish'd the Laws of that Motion, needed not more particularly

* *Aristotle* speaking of *Anaxagoras* in the first Ch. of the last Book of his *Physicks*, hath this passage: *Dicit (Anaxagoras) cum omnia simul essent, atque quiescerent tempore infinito, Mentem movisse, ac segregasse.*

interpose

interpose for the Production of Things Corporeal, nor even of Plants or Animals, which according to him are but Engines: I do not at all believe, that either these *Cartesian Laws of Motion*, or the *Epicurean casual Concourse* of Atoms, could bring meer Matter into so orderly and well contriv'd a Fabrick as This World; and therefore I think, that the wise Author of Nature did not only *put Matter into Motion*, but when he resolv'd to make the World, did so regulate and *guide the Motions* of the small parts of the Universal Matter, as to reduce the greater Systems of them into the Order they were to continue in; and did more particularly contrive some portions of that Matter into Seminal Rudiments or Principles, lodg'd in convenient Receptacles, (and as it were Wombs,) and others into the Bodies of Plants and Animals: one main part of whose Contrivance, did, as I apprehend, consist in this, That some of their Or-
gans

gans were so fram'd, that, supposing the
 Fabrick of the greater Bodies of the U-
 niverse, and the Laws he had establish'd
 in Nature, some Juicy and Spirituous
 parts of these living Creatures must be
 fit to be turn'd into Prolifick Seeds,
 whereby they may have a power, by
 generating their like, to propagate their
Species. So that according to my ap-
 prehension, it was *at the beginning* ne-
 cessary, that an Intelligent and Wise
 Agent should contrive the Universal
 Matter into the World, (and especially
 some Portions of it into Seminal Or-
 gans and Principles,) and settle the
 Laws, according to which the Motions
 and Actions of its parts upon one ano-
 ther should be regulated: without which
 interposition of the Worlds Architect,
 however *moving Matter* may with some
probability (for I see not in the Notion
 any Certainty) be conceiv'd to be able,
 after numberless Occursions of its insen-
 sible parts, to cast it self into such
 grand

grand Conventions and Convolutions, as the Cartesians call *Vortices*, and as, I remember, **Epicurus* speaks of under the name of *inconspicuis, & divinis*; yet I think it utterly improbable, that *brute* and *unguided*, though *moving*, Matter, should ever convene into such admirable Structures, as the Bodies of perfect Animals. But the World being once fram'd, and the course of Nature establish'd, the Naturalist, (except in some few cases, where God, or Incorporeal Agents interpose,) has recourse to the first Cause but for its general and ordinary Support and Influence, whereby it preserves Matter and Motion from Annihilation or Desition; and in explicating *particular Phenomena*, considers onely the *Size, Shape, Motion*, (or want of it) *Texture*, and the resulting Qualities and Attributes of the small particles of Matter. And thus in this great *Automaton* the World, (as in a Watch

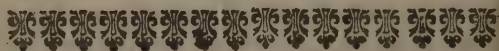
* *Epicurus* in his Epistle to *Pythocles*.

that make the Latter part of this present Treatise, (especially the Fifth and 7th of them,) which, containing Experiments of the Changing the Form of a Salt and a Mettal, do chiefly belong to the Historical or Experimental part of what we deliver touching the Origine of Forms. And indeed, besides the *two kinds* of Experiments presently to be mention'd, we might here present you a Third sort, consisting *partly* of divers Relations of Metalline Transmutations, deliver'd upon their own Credit by Credible men, that are not Alchymists; and *partly* of some Experiments (some made, some directed by us) of Changing both Bodies, totally *inflammable*, almost totally into *Water*, and a good part ev'n of *distill'd Rain water* without Additament into *Earth*; and distill'd Liquors, readily and totally mingleable with Water, *pro parte* into a true *Oyle*, that will not mix with it. This sort of Experiments, I say, I might
here

here annex, if I thought fit, in this place, either to lay any stresse upon those, that I cannot my self make out, or to transfer hither those Experiments of Changes amongst Bodies not Metalline, that belong to another *Treatise. But over and above, what the past Notes and the Experiments, that are to follow them, contain towards the making of what we teach concerning Forms, we will here, for further Confirmation, proceed to adde two sorts of Experiments, (besides the Third already mention'd.) *The one*, wherein it appears, that Bodies of very differing Natures, being put together, like the Wheels, and other peices of a Watch, and by their connection acquiring a new Texture, and so new Qualities, may, without having recourse to a substantial Form, compose such a new Concrete, as may as well deserve to have a substantial Form attributed to it, by virtue of that new Dis-

* The Sceptical Chymist.

position of its parts, as other Bodies that are said to be endow'd therewith. And the *other*, that a Natural Body being dissipated, and as it were taken in peices, like a Watch, may have its parts so associated, as to constitute New Bodies, of Natures very differing from its own, and from each other; and yet these dissipated and scatter'd parts, by being recollected and put together again, like the pieces of a Watch, in the like order as before, may recompose (almost, if not more then almost) such another Body, as that they made up, before they were taken asunder.



EXPE-



I.

EXPERIMENTS, and THOUGHTS, about the *Production* and *Repro-* *duction* of FORMS.

IT was not at randome, that I spoke,
when, in the foregoing Notes about
the Origine of Qualities, I intimated,
That 'twas very much by a kind of tacit
agreement, that Men had distinguish'd
the *Species* of Bodies, and that those
Distinctions were more Arbitrary then
we are wont to be aware of. For I con-
fesse, that I have not yet, either in *Ari-*
stotle, or any other Writer, met with a-
ny genuine and sufficient Diagnostick
and Boundary, for the Discriminating

and limiting the *Species* of Things, or to speak more plainly, I have not found, that any Naturalist has laid down a determinate Number and sort of Qualities, or other Attributes, which is *sufficient* and *necessary* to constitute all portions of Matter, endow'd with them, distinct Kinds of Natural Bodies. And therefore I observe, that most commonly Men look upon these as *Distinct Species* of Bodies, that have had the luck to have distinct Names found out for them; though perhaps diverse of them differ much less from one another, then other Bodies, which (because they have been hudled up under one Name,) have been look'd upon, as but one sort of Bodies. But not to lay any weight on this Intimation about Names, I found, that for want of a true Characteristick, or discriminating notes, it hath been, and is still, both very *uncertain* as to divers Bodies, whether they are of different *Species* or of the same, and

and very *difficult* to give a sufficient reason, why divers Bodies, wherein Nature is assisted by Art, should not as well pass for distinct kinds of Bodies, as others, that are generally reckon'd to be so.

Whether (for instance) Water and Ice be not to be esteem'd distinct kinds of Bodies, is so little evident, that some, that pretend to be very well vers'd in *Aristotle's* Writings and Opinions, affirm him to teach, that Water looses not its own nature by being turn'd into Ice; and indeed I remember I have read a * Text of his, that seems express enough to this purpose, and the thing it self is made plausible by the reducibleness of ice back again into Water. And yet I remember, *Galen* is affirm'd to make these two, distinct *species* of Bo-

* See Lib. I. de Gen. & Cor. t. 80. Idem Corpus (sayes he there) *quantquam continuum, aliàs liquidum, aliàs concretum videmus, non divisione aut compositione hoc passum, aut conversione, aut actu, sicuti Democritus asserit: nam neque transpositione, neque Naturæ demutatione (ἐπὶ τὸ μεταβάλλον τὴν φύσιν) ex liquido concretum evadere solet,*

dies; which Doctrine is favour'd by the differing Qualities of Ice and Water, for not onely the one is fluid, and the other solid, and even brittle, but Ice is also commonly more or less opacous in comparison of Water, being also lighter then it *in specie*, since it swims upon it. To which may be added, that Ice, beaten with common Salt, will freeze other Bodies, when Water mingled with Salt will not. And on this occasion, I would propose to be resolv'd, whether Must, Wine, Spirit of Wine, Vinegar, Tartar, and Vappa, be Specifically distinct Bodies? and the like question I would ask concerning a Hens Egg, and the Chick that is afterwards hatch'd out of it: As also concerning Wood, Ashes, Soot, and likewise the Eggs of Silkworms, which are first small Caterpillars, or (as some think them) but Worms, when they are newly hatch'd, and then *Aurelia's*, (or husked Maggots,) and then Butterflies, which I have

have observ'd with pleasure to be the successive Production of the Prolifick Seed of Silkworms. And whether the Answer to these Quæries be Affirmative or Negative, I doubt the reason, that will be given for either of the two, will not hold in divers cases, whereto I might apply it. And a more puzzling Question it may be to some, whether a Charcoal, being thoroughly kindled, do specifically differ from another Charcoal; for, according to those I argue with, the fire has *penetrated* it quite through; and therefore some of the recent *Aristotelians* are so convinc'd of its being transmuted, that all the satisfaction I could find from a very subtle modern Schoolman to the Objection, That if the glowing Coal were plung'd into Water, it would be a black Coal agen, was, That notwithstanding That reduction, the Form of a Charcoal had been once abolish'd by the fire, and was reproduc'd by God, upon the regain'd Disposition
of

of the Matter to receive it.

Nor is it very easie to determine, whether Clouds, and Rain, and Hail, and Snow, be bodies specifically distinct from Water, and from each other, and the writers of Meteors are wont to handle them as distinct. And since if such slight differences as those, that discriminate these Bodies, or that which distinguishes Wind from Exhalations, whose Course makes it, be sufficient to constitute differing kinds of Bodies, 'twill be hard to give a satisfactory Reason, why other Bodies, that differ in more or more considerable particulars, should not enjoy the same Priviledge. And I presume, that Snow differs less from Rain, then Paper doth from Rags, or Glass made of Wood-ashes does from Wood. And indeed, Men having, by tacit consent, agreed to look upon Paper, and Glass, and Soape, and Sugar, and Brasse, and Ink, and Pewter, and Gunpowder, and I know not how many others, to be distinct

distinct sorts of Bodies, I see not, why they
 may not be thought to have done it, on
 as good grounds, as those, upon which
 divers other differing *Species* of Bodies
 have been constituted. Nor will it suf-
 fice to object, that these Bodies are *fa-*
ctitious; for 'tis the present nature of
 Bodies, that ought to be consider'd in
 referring them to *Species*, which way
 soever they came by that Nature: for
 Salt, that is, in many Countries, made by
 boiling Sea water in Cauldrons, and o-
 ther vessels, is as well true Sea-salt, as
 that which is made in the Isle of *Man*,
 (as Navigators call it,) without any co-
 operation of Man, by the bare action of
 the Sun upon those parts of the Sea wa-
 ter, which chance to be left behind in
 hollow places, after a high Spring-tide.
 And Silk worms, which will hatch by
 the heat of humane Bodies, and Chick-
 ens, that are hatch'd in *Egypt* by the
 heat of Ovens or Dunghills, are no less
 true Silk-worms or Chickens, then
 those

those that are hatch'd by the Sun, or by Hens.

As for what may be objected, that we must distinguish betwixt Factitious Bodies and Natural, I will not now stay to examine, how far that Distinction may be allow'd: for it may suffice for our present purpose to represent, that whatever may be said of Factitious Bodies, where Man does, by Instruments of his own providing, onely give Figure, or also Contexture to the *sensible* (not insensible) parts of the Matter he works upon; as when a Joyner makes a Stool, or a Statuary makes an Image, or a Turner a Bowl: yet the case may be very differing in those other factitious Productions, wherein the *insensible* parts of Matter are alter'd by Natural Agents, who perform the greatest part of the work among themselves, though the Artificer be an Assistant, by putting Them together after a due manner. And therefore I know not, why all the Productions

ductions of the Fire made by Chymists should be look'd upon, as not Natural, but Artificial Bodies: since the Fire, which is the grand Agent in these Changes, doth not, by being imploy'd by the Chymist, cease to be, and to work as, a Natural Agent. And since Nature her self doth, by the help of the fire, sometimes afford us the like Productions that the Alchymists art presents us: as in *Aetna, Vesuvius*, and other burning Mountains, (some of whose Productions I can shew you,) Stones are sometimes turn'd into Lime, (and so an Alcalizate Salt is produc'd,) and sometimes, if they be more dispos'd to be flux'd, then calcin'd, brought to vitrification; Metalline and Mineral Bodies are by the violence of the fire colliquated into Masses of very strange and compounded Natures. Ashes and Metalline flowers of divers kinds are scatter'd about the neighbouring places, and copious flowers of Sulphur, sublim'd
by

by the internal fire, have been several times found about the Vents, at which the Fumes are discharg'd into the Air: (As I have been assur'd by Ingenious Vifiters of such Places, whom I purposely inquir'd of, touching these *flores*; for of these Travellers more then one answer'd me, they had themselves gather'd, and had brought some very good.) Not to adde, that I have sometimes suspected, upon no absurd grounds, that divers of the Minerals and other Bodies, we meet with in the lower parts of the Earth, and think to have been formed and lodg'd there ever since the beginning of Things, have been since produc'd there by the help of subterranean fires, or other heats, which may *either* by their immediate action, and exceedingly long application, very much alter some Bodies by changing their Texture; as when Lead is turn'd into Minium, and Tin into Putty by the operation of the fire in a few hours, *or* by
ele-

elevating, in the form of Exhalations or Vapours, divers Saline and Sulphureous Corpuscles or Particles of unripe (or to use a Chymical Term of Art) Embri-
 onated Minerals, and perhaps Mettals, which may very much alter the Nature, and thereby vary the Kind of other subterranean Bodies, which they pervade, and in which they often come to be incorporated; *or else* may, by convening among themselves, constitute particular Concretions, as wee see that the fumes of Sulphur and those of Mercury unite into that Lovely red Mass, which in the Shops they call Vermilion, and which is so like to the Mineral, whence we usually obtain Mercury, that the *Latines* give them both the same Name *Cinnabaris*, and in that are imitated by the French and Italians; in whose favour I shall adde, That if we suppose this Mineral to consist of a stony Concretion, penetrated by such Mineral fumes as I have been speaking of, the
 Ap;

Appellation may be better excus'd then perhaps you imagine, since from *Cinnabaris nativa* not onely I obtain'd a considerable quantity of good running Mercury, (which is That, Men are wont to seek for from it,) but to gratifie my Curiosity somewhat further, I try'd an easie way, that came into my mind, whereby the *Caput mortuum* afforded me no despicable Quantity of good combustible Sulphur. But this upon the By, being not oblig'd to set down here the grounds of my Paradoxical Conjecture about the Effects of subterranean Fires and Heats, since I here lay no stress upon it, but return to what I was saying about *Aetna*, and other Volcans. Since then these Productions of the Fire, being of Nature's own making, cannot be deny'd to be Natural Bodies, I see not why the like Productions of the Fire should be thought unworthy that Name, onely because the Fire, that made the former, was kindled

led by chance in a Hill, and that which produc'd the latter was kindled by a Man in a Furnace. And if flower of Sulphur, Lime, Glass, and colligated mixtures of Metals and Minerals are to be reckon'd among Natural Bodies, it seems to be but reasonable, that, upon the same grounds, we should admit flower of Antimony, Lime, and Glass, and Pewter, and Brass, and many other Chymical Concretes, (if I may so call them) to be taken into the same number; and then 'twill be evident, that to distinguish the *species* of Natural Bodies, a Concourse of Accidents will, without considering any Substantial Form, be sufficient.

But because I need not, on this occasion, have recourse to instances of a disputable nature, I will pitch, for the illustration of the Mechanical Production of Forms, upon Vitriol. For since Nature her self, without the help of Art, does oftentimes produce that Concrete,

Q

(as

(as I have elsewhere shewn by Experience,) there is no reason why Vitriol, produc'd by easie Chymical Operations, should not be look'd upon as a Body of the same Nature and Kind. And in Factitious Vitriol, our knowing what Ingredients we make use of, and how we put them together, inables us to judge very well, how Vitriol is produc'd. But because it is wont to be reckon'd with Salt-petre, Sea-salt, and Sal Gem among true Salts, I think it requisite to take notice in the first place, that Vitriol is not a meer Salt, but That, which *Paracelsus* somewhere, and after him divers other Spagyrist, call a Magistery, which in their sense (for there are that use it in another,) commonly signifies a Preparation, wherein the Body to be prepar'd has not its *Principles separated*, as in Distillation, Incineration, &c. but wherein the *whole Body* is brought into another form, by the *addition* of some Salt or Menstruum, that

that is united *per minima* with it. And agreeably to this Notion we find, that from common Vitriol, whether native or factitious, may be obtain'd (by Distillation and Reduction) an acid Saline Spirit, and a Metalline Substance, as I elsewhere mention, that from blew Vitriol, Copper may be (by more then one way) separated. And I the rather give this Advertisement, because that *as* there is a Vitriol of Iron, which is usually green; and another of Copper, which is wont to be blew, and also a white Vitriol, about which it is disputed what it holds, (though that it holds some Copper I have found,) and yet all of these are without scruple reputed true Vitriols, notwithstanding that they differ so much in Colour, and (as I have discover'd) in several other Qualities; so I see no reason, why the other Minerals, being reduc'd by their proper Menstruums into Salt like Magisteries, may not pass for the Vitriols of those Metals,

and consequently for Natural Bodies: which, if granted, will adde some confirmation to our Doctrine, though its being granted is not necessary to make it out. For, to confine our selves to Vitriol, 'tis known among Chymists, that if upon the filings of *Mars* one put a convenient quantity of that acid distill'd Liquor, which is (abusively) wont to be call'd Oyl of Vitriol, diluting the mixture with Rain, or with common Water, 'tis easie by Filtrating the Solution, by Evaporating the Aqueous superfluity of it, and by leaving the rest for a competent while in a Cellar, (or other cold place) to Christallize, 'tis easie, I say, by this means to obtain a Vitriol of Iron; which agrees with the other Vitriol of Vitriol-stones or Marchasites, presented us, by Nature, without the help of any other Menstruum, then the Rain that falls upon them from the Clouds, in I know not how many Qualities, part Obvious, and part of them

them Occult: As, (of the *first sort*) in Colour, Transparency, Brittlenesse, easiness of Fusion, Styptical Taſt, reducibleness to a Red Powder by Calcination, and other Qualities more obvious to be taken notice of; to which may be annex'd divers Qualities of the *second sort*, (I mean the more abstruse ones,) as the power to turn in a trice an Infusion of Galls, made in ordinary water, (as also to turn a certain clear Mineral Solution, elsewhere mention'd,) into an Inckly colour, to which, in all probability, we may adde a faculty of causing Vomits even in a small Dose, when taken into the Stomach of a Man, and that remarkable property of being endow'd with as exact and curious a shape or figure, as Those, for which Salts have been, by modern Philosophers especially, so much admir'd. But, that no scruple might arise from hence, that in the *Vitriolum Martis*, wont to be made by Chymists, the Menstruum,

that is imploy'd, is the Oyl of common Vitriol, which may be suspected to have retain'd the nature of the Concrete whence it proceeded, and so this Factitious Vitriol may not be barely a new Production, but partly a Recorporification, as they speak, of the Vitriolate Corpuscles contain'd in the Menstruum: To prevent this Scruple I say, (which yet perhaps would not much trouble a Considering Chymist,) I thought fit to imploy a quite other Menstruum, that would not be suspected to have any thing of Vitriol in it. And though *Aqua fortis*, and Spirit of Nitre, however they *corrode* Mars, are unfit for such a work, yet having pitch'd upon Spirit of Salt instead of Oyl of Vitriol, and proceeding the same way that has been already set down, it answer'd our Expectation, and afforded us a good green Vitriol. Nor will the great disposition, I have observ'd in this our Vitriol, to resolve, by the moisture of the Air, into

a Liquor, make it essentially differing from other Vitriols, since it has been observ'd, and particularly by *Guntherus Belichius* more then once, that even the common Vitriol he us'd in *Germany*, will also, though not so easily as other Salts, run (as the Chymists phrase it) *per deliquium*. And to make the Experiment more compleat, though we did not find either Oyl of Vitriol, or Spirit of Salt, good Menstruums to make a blew Venereal Vitriol out of Copper, (however fil'd, or thinly laminated,) and though upon more Tryals then one, it appear'd, that *Aqua fortis*, & Spirit of Nitre, which we thought fit to substitute to the above mention'd Liquors, did indeed make a Solution of Copper, but so unctuous a one, that twas very hard to bring any part of it to dryness, without spoyling the Colour and Shape of the desir'd Body: yet repeating the Experiment with care and watchfulness, we, this way, obtain'd one of the loveliest

loveliest Vitriols that hath perhaps been seen, and of which you your self may be the judg by a parcel of it I keep by me for a Rarity.

To apply now these Experiments, especially That, wherein Spirit of Salt is imploy'd, to the purpose, for which I have mention'd them, let us briefly consider these two things; the one, that our Factitious Vitriol is a Body, that, as well as the Natural, is endow'd with many Qualities, (manifest, and occult,) not onely such as are common to it with other Salts, as Transparency, Brittleness, Solublenesse in Water, &c. but such as are Properties peculiar to it, as Greenness, easiness of Fusion, Stypticity of Taste, a peculiar Shape, a power to strike a Black with infusion of Galls, an Emetick faculty, &c.

The other thing we are to consider is, that though these Qualities are in common Vitriol believ'd to flow from the substantial Form of the Concrete, and

and may, as justly as the Qualities, whether manifest or occult, of other Inanimate Bodies, be imploy'd as Arguments to evince such a Form: yet in our Vitriol, made with Spirit of Salt, the same Qualities and Properties were produc'd by the associating and juxtaposition of the two Ingredients, of which the Vitriol was compounded, the Mystery being no more but this, That the Steel being dissolv'd in the Spirit, the Saline Particles of the former, and the Metal-line ones of the latter, having each their Determinate Shapes, did by their Association compose divers Corpuscles of a mix'd or compounded Nature, from the Convention of many whereof, there resulted a new Body, of such a Texture, as qualify'd it to affect our Sensories, and work upon other Bodies, after such a manner as common Vitriol is wont to do. And indeed in our case, not only it cannot be made appear, that there is any substantial Form generated anew,

but

but that there is not so much as an exquisite mixture, according to the common Notion the Schools have of such a Mixture. For Both the Ingredients retain their Nature, (though perhaps somewhat alter'd,) so that there is, as we were saying, but a Juxta-position of the Metalline and Saline Corpuicles; onely they are associated so, as by the mannner of their Coalition to acquire that new Texture, which Denominates the Magistery they compose, Vitriol. For 'tis evident, that the Saline Ingredient may either totally, or for much the greatest part be separated by Distillation, the Metalline remaining behind. Nay some of the Qualities, we have been ascribing to our Vitriol, do so much depend upon Texture, that the very Beams of the Sun (converg'd) will, as I have purposely try'd, very easily alter its Colour, as well as spoyle its Transparency, turning it at first from Green to White, and, if they be center'd

center'd by a good Burning glass, making it change that Livery for a deep Red.

*Doubts and Experiments, touching the
Curious Figures of SALTS.*

AND here let me take notice, that though the exact and curious Figures, in which Vitriol and other Salts are wont to shoot, be made Arguments of the *Presence*, and great Instances of the *Plastick skill* of substantial Forms and Seminal Powers, yet, I confess, I am not so fully satisfied in this matter, as even the Modern Philosophers appear to be. 'Tis not that I deny, that *Plato's* excellent Saying, *παντα ἔστι θεός*, may be apply'd to these exquisite Productions of Nature. For though God has thought fit to make things Corporeal after a much more facile and intelligible way, then by the intervention of substantial Forms; and though the Plastick

stick power of Seeds, which in Plants and Animals I willingly admit, seem not in our case to be needful; yet is the Divine Architect's Geometry (if I may so call it) neverthelesse to be acknowledg'd and admir'd; for having been pleas'd to make the *primary* and insensible Corpuscles of Salts and Metals of such determinate, curious, and exact Shapes, that, as they happen to be associated together, they should naturally produce Concretions, which, though *differently* figur'd according to the respective Natures of their Ingredients, and the various manners of their Convening, should yet be all of them very *curious*, and seem elaborate in their Kinds. How little I think it fit to be allow'd, that the Bodies of Animals, which consist of so many curiously fram'd and wonderfully adapted Organical parts, (and whose Structure is a thousand times more Artificial then that of Salts, and Stones, and other Minerals,) can be reasonably
sup

suppos'd to have been produc'd by Chance, or without the Guidance of an Intelligent Author of Things, I have elsewhere largely declar'd. But I confess, I look upon these Figures we admire in Salts, and in some kinds of Stones, (which I have not been Incurious to collect,) as Textures so simple and slight in comparison of the Bodies of Anima's, & oftentimes in comparison of some one Organical part, that I think it cannot be in the least interr'd, that because such slight Figurations need not be ascrib'd to the Plastick power of Seeds, it is not necessary, that the stupendious and incomparably more elaborate Fabrick and structure of Animals themselves should be so. And this premis'd, I shall adde, that I have been inclin'd to the Conjecture about the shapes of Salts, that I lately propos'd, by these Considerations.

First, That by a bare Association of Metalline and Saline Corpuscles, a Concrete

crete, as finely figur'd as other Vitriols, may be produc'd, as we have lately seen.

Secondly, because that the Figures of these Salts are not constantly in all respects the same, but may in diverse manners be somewhat varied, as they happen to be made to shoot more hastily, or more leisurely, and as they shoot in a scatter, or in a fuller proportion of Liquor. This may be easily observ'd by any, that will but with a little Attention consider the difference that may be found in Vitriolate Christsals or Grains, when quantities of them were taken out of the great Coolers, as they call them, wherein that Salt, at the Works where tis boyl'd, is wont to be set to shoot. And accordingly, where the Experienc'd Mineralist *Agricola*, describes the several wayes of making Vitriol in great Quantities, he does not onely more then once call the great Grains or Christsals, into which it coagulates, Cubes; but speaking of the manner of their
Con-

Concretion about the Cord's or Ropes, that are wont (in *Germany*) to be hang'd from certain cross Bars into the Vitriolate Water or Solution for the Vitriol to fasten its self to; he compares the Concretions indifferently to Cubes or Clusters of Grapes: *Ex his* (says he, speaking of the cross Bars,) *pendent restes lapillis extentæ, ad quos humor spissus adhaerescens densatur in translucentes atramenti sutorii vel Cubos, vel Acinos, qui una speciem gerunt.* I remember also, that having many years since a suspicion, that the Reason why *Alkalis*, such as Salt of Tartar and Pot-ashes are wont to be obtain'd in the form of white Powders or *Calces*, might be the way, wherein the Water, or the Lixiviums, that contain them, is wont to be drawn off, I fancied, that by leaving the Saline Corpuscles a competent quantity of Water to swimme in, and allowing them leasure for such a multitude of

* *Georg. Agricola de re metall. lib. 12. p. 462.*

Occur-

Occursions, as might suffice to make them hit upon more congruous Coalitions then is usual, I might obtain Chrystals of Them, as well as of other Salt: conjecturing this, I say, I caus'd some well purify'd *Alkalys*, dissolv'd in clear water, to be slowly evaporated, till the Top was cover'd with a thin Ice-like Crust, then taking care not to break That, least they should (as in the ordinary way, where the Water is all forc'd off,) want a sufficient stock of Liquor, I kept them in a very gentle heat for a good while; and then breaking the above mentioned Ice like Cake, I had, as I wish'd, divers figured Lumps of Chrystalline Salt shot in the Water, and transparent almost like white Sugar Candy.

I likewise remember, that having, on several occasions, distill'd a certain quantity of Oyl of Vitriol, with a strong Solution of Sea-salt, till the remaining Matter was left dry, that Saline Resi-

due

due being dissolv'd in fair water, filter'd, and gently evaporated, would shoot into Christals, sometimes of one figure, sometimes of another, according as the quantity or strength of the Oyl of Vitriol and other Substances determin'd. And yet these Christals, though sometimes they would shoot into Prisme-like Figures, as Roch'd Petre; and sometimes into shapes more like to Allome or Vitriol; nay though oftentimes the same *Caput mortuum* dissolv'd, would in the same Glas shoot into Christals, whereof some would be of one shape, some of another; yet would these differing Grains or Christals appear for the most part more exquisitely figur'd, then oftentimes Vitriol does. From Spirit of Urine and Spirit of Nitre, when I have suffer'd them to remain long together before Coagulation, and free'd the mixture from the superfluous moisture very slowly, I have sometimes obtain'd fine long Christals,

R

(some

(some of which I can shew you) so shap'd, that most Beholders would take them for Christsals of Salt-petre. And I have likewise tryed, that whereas Silver is wont to shoot into Plates exceeding thin, almost like those of *Moscovia* glass, when I have dissolv'd a pretty quantity of it in *Aqua fortis*, or spirit of Nitre, and suffer'd it to shoot very leisurely, I have obtain'd Lunar Christsals, (several of which I have yet by me,) whose Figure, though so pretty as to have given some wonder even to an Excellent Geometrician, is differing enough from that of the thin Plates formerly mention'd; each Christsal being compos'd of many small and finely shap'd Solids, that stick so congruously to one another, as to have one surface, that appear'd Plain enough, common to them all.

Thirdly, that insensible Corpuscles of different, but all of them exquisite, shapes, and endowed with plain as well

as smooth sides, will constitute Bodies variously, but all very finely figur'd, I have made use of several waies to manifest. And first, though Harts-horn, Bloud, and Urine, being resolv'd, and (as the Chymists speak) Analiz'd by Distillation, may well be suppos'd to have their substantial Forms (if they had any) destroy'd by the action of the Fire: yet in regard the Saline Particles, they contain, are endow'd with such figures as we have been speaking of, when in the Liquor, that abounds with either of these volatile Salts, the dissolv'd Particles do leisurely shoot into Crystals, I have divers times observ'd, in these, many Masses, (some bigger, and some less,) whose surfaces had Plains, some of Figures, as to sense exactly Geometrical, and others very curious and pleasant. And of these finely shap'd Crystals of various sizes, I have pretty store by me. And because (as it may be probably gather'd from the Event)

the Saline Corpuscles of Stillatitious acid liquors, and those of many of the Bodies, they are fitted to dissolve, have such kind of Figures as we have been speaking of, when the solutions of these Bodies, upon the recess of the superfluous moisture, shoot into Christals; these, though they will sometimes be differing enough, according to the particular natures of the dissolv'd Bodies and the Menstruum, yet either the Christals themselves, or their Surfaces, or both, will oftentimes have fine and exquisite Figures, as I have try'd by a Menstruum, wherewith I was able to dissolve some Gems; as also with a solution of Coral, made with Spirit of Verdigreese, to omit other Examples. And for the same reason, when I try'd whether the Particles of Silver, dissolv'd in *Aqua fortis*, would not, without Concoagulating with the Salts, convene, upon the Account of their own shapes, into little Concretions of smooth and flat surfaces,

ces. I found, that having (to afford the Metalline Corpuscles scope to move in) diluted one part of the Solution with a great many parts of distill'd Rain water, (for common water will oftentimes make such Solutions become white or turbid,) a Plate of Copper being suspended in the Liquor, and suffer'd to lie quiet there a while, (for it need not be long) there would settle, all about it, swarms of little Metalline and Undiaphanous Bodies, shining in the water like the scales of small Fishes, but form'd into little Plates extremely thin, with surfaces not onely flat, but exceeding glossy: and among those, divers of the larger were prettily figur'd at the Edges. And as for Gold, its Corpuscles are sufficiently dispos'd to convene with those of fit or congruous Salts into Concretions of determinate Shapes, as I have found in the Chrystals I obtain'd from Gold dissolv'd in *Aqua Regis*, and after having been suffer'd to loose its

superfluous moisture, kept in a cold place: and not onely so, but also when by a more powerful Menstruū I had subdivided the Body of Gold into such minute Particles, that they were sublimable, (for That, I can assure you, is possible,) these volatile Particles of Gold, with the Salts, wherewith they were elevated, afforded me (sometimes) store of Christals, which, though not all of them near of the same Bigness, resembled one another in their shape, which was regular enough, and a very pretty one. But of this more elsewhere. §. I remember I have also long since taken pleasure to dissolve two or more of those saline Bodies, whose shapes we know already, in fair Water, that by a very gentle Evaporation I might obtain Concretions, whose Shapes should be, though curious, yet differing from the Figure of either of the Ingredients. But we must not expect, that, in all cases, the Salts dissolv'd together should be *totally* com-

compounded: for oftentimes they are of such different Natures, that one will shoot much sooner then another, and then it frequently happens, that a good Proportion of that will be first Crystalliz'd in its own shape: as is conspicuously to be observ'd in the refining of that impure Petre, (which, from the Country that affords it, the Purifiers call *Barbary Nitre*,) from the common Salt it abounds with: and (also,) as *Agricola* observes,* that in some cases, where a Vitriolate Matter is mingled with that, which yields Allom, those two kinds of Salts will shoot separately in the same large vessel, (which the Tryals, I have made with the compounded Solutions of those two Salts, do not discountenance.) Now in such cases, all that can be expected, or needs be desir'd, is, that the remaining part of the mixture, or some portion of it, afford Crystals, or Grains of compounded solid figures.

* *G. Agricola de re Metallica. lib. 12.*

Though the *Venetian* Borax, wont to be sold in shops, be known to be a factitious Body, compounded of several Salts, that I shall not now stay to enumerate; and though, when we buy it, we usually find it to consist of Lumps and Grains mishapen enough, yet when I dissolv'd some of it in a good quantity of fair water, and made it coagulate very leisurely, I had Chrystals, upon whose surfaces I could perceive very exquisite and, as to sense, regular Geometrical figures. And one thing I must not here by any means prætermitt, which is, that though the *Caput mortuum* of common *Aqua fortis* consists of Bodies of very differing Natures, (for such are Nitre and Vitriol,) and has been expos'd to a great violence of the Fire, yet I have sometimes admir'd the curiousness of those figures, that might be obtain'd barely by frequent Solutions and Coagulations of the Saline Particles of this *Caput mortuum* in fair water. But be-
cause

cause the Glasses, wherein my Concre-
tions were made, were too little to af-
ford great Christals, and they ought to
shoot very slowly; I choose rather to
shew the Curious some large Christals,
which I took out of the Laboratory of
an Ingenious Person, who, without
minding the Figures, had upon my Re-
commendation made great quantity of
that Salt, in large vessels, for a Medicine:
(it being the *Panacea duplicata*, so fa-
mous in *Holstein*.) For *divers* of these
Christals have not onely Triangles,
Hexagons, and Rhomboids, and other
Figures exquisitely Cut on their smooth
& specular surfaces; and *others*, Bodies of
Prismatical shapes: But some of them are
no less accurately figur'd then the finest
Nitre or Vitriol I remember my self to
have observ'd, and some also terminate
in Bodies almost like Pyramids, consi-
sting of divers Triangles, that meet in
one Vertical point, and are no less admi-
rably shap'd then the fairer sort of
Cornish

Cornish Diamonds, that have been brought me for Rarities. Besides, the producing of Salts of new shapes, by compounding of Saline Bodies, I have found it to be practicable not onely in some Gross, or, as they speak, Corporal Salts, such as Sea-salt, Salt-petre, but also in some Natural and some Chymical Salts dissolv'd together; and, which perhaps you will think more considerable in saline Spirits, made by distillation: Not that all of them are fit for this purpose, but that I have found divers of those, that work upon one another with Ebullition, to be so. For in that Conflict the Saline Corpuscles come to be associated to one another, and thereby, or by their newly acquir'd figure, whilst their Coalition lasts, to loose much of their former Volatility: so that, upon Evaporation of the superfluous Liquor, they will not fly, as otherwise they might; but concoagulate into finely shap'd Chrystals, as I have try'd
among

among other Saline Liquors, with Spirit of Urine, and Spirit of Nitre, and with Oyl of Vitriol, and Spirit of fermented Urine with Spirit of Sheeps bloud, and spirit of Salt, and also with the Spirits of Salt and of Urine; which Last Experiment I the rather mention, because it shews, by the difference of the Christals, afforded by those two Liquors, from the Christals resulting from one of them, namely the spirit of Urine, (or if you please, the Volatile Salt, wherewith it abounds,) concoagulated with a fit Dose of Oyl of Vitriol, how much those compounded emergent figures depend upon the more simple figures of the saline Corpuscles, that happen to convene into those new Concretes. For the spirit of Urine, satiated with spirit of Salt, and both very gently, and not too far, Evaporated, often afforded me Christals, that differ'd exceedingly in shape from those, which I obtain'd from the same spirit of Urine, satiated,

fatiated, either with Oyl of Vitriol, or
 with Spirit of Nitre. For, (to adde
 That upon the By,) that Salt, compoun-
 ded of the two Spirits of Urine and of
 common Salt, is wont to be very pret-
 tily figur'd, consisting of one long
 Beam as it were, whence on both sides
 issue out far shorter Christals, some-
 times perpendicular to that, and paral-
 lel to one another like the Teeth in a
 Combe, and sometimes so inclining, as
 to make the Whole appear almost like
 a Feather; which is the more remarkable,
 because I have (many years ago) ob-
 serv'd, that common *Sal Armoniack*,
 that is made of Urine and common Salt,
 both crude, with a Proportion of Soot,
 will, if warily dissolv'd, and coagulated,
 shoot into Christals of the like shape.
 How far the unknown Figure of a Salt
 may Possibly (for I fear it will not Easi-
 ly) be guess'd at, by that of the Figure,
 which it makes with some other Salt,
 whose Figure is already known, I leave
 to

to Geometricians to consider; having, I fear, insisted too long on this subject already. But yet I must adde one particular more, which will, as well illustrate and confirme much of what has been said above touching the Origination of Vitriol, as shew, that the Shape of Vitriol depends upon the Textures of the Bodies, whereof it is compos'd.

Fourthly then, when I consider'd, that (as I formerly noted) Vitriol being but a Magistery, made by the concoagulation of the Corpuscles of a dissolv'd Metal, with those of the Menstruum, the Magisteries of other Metals might, without inconvenience, be added, as other Vitriolate Concretes to the green, the blew, and white Vitriol, that are without scruple referr'd to the same *species*: and when I consider'd, that Oyl of Vitriol was not a fit Menstruum to *dissolve* divers of the Metals, nor even all those, that it will *corrode*; and that the like unsuitness also is to be found in
com.

common Spirit of Salt, I pitch'd upon *Aqua fortis* or spirit of Nitre, as that Menstruum, which was likeliest to afford variety of Vitriols: and accordingly I found, that besides the Lovely Vitriol of Copper formerly mention'd, that Liquor would with Quicksilver afford one sort of Christals, with Silver another, and with Lead a third; all which Christals of Vitriol, as they differ'd from each other in other Qualities, (upon which score you will find this Experiment elsewhere mention'd,) so they did very manifestly and considerably differ in Shape: the Christals of Silver shooting in exceeding thin Plates, and those of Lead and Quick-silver obtaining figures, though differing enough from each other, yet of a far greater depth and thickness, and lesse remote from the figure of common Vitriol or Sea salt: and yet all these Vitriols, especially That of crude Lead, when it was happily made, had Shapes curious and elaborate,

as well as those, we admire in common
Vitriol or Sea-salt.

IF then these Curious shapes, which are
believed to be of the admirablest Ef-
fects, and of the strongest Proofs of
Substantial Forms, may be the Results
of Texture, and if Art can produce Vi-
triol its self, as well as Nature, why may
we not think, that in ordinary *Phenome-
na*, that have much less of wonder, re-
course is wont to be had to substantial
Forms without any Necessity? (Matter,
and a Convention of Accidents being
able to serve the turn without them,)
and why should we wilfully exclude
those Productions of the Fire, wherein
the Chymist is but a Servant to Nature,
from the number of Natural Bodies?
And indeed, since there is no certain
Diagnostick agreed on, whereby to dis-
criminate Natural and Factitious Bo-
dies, and constitute the *species* of both;
I see not, why we may not draw Argu-
ments

ments from the Qualities and Operations of several of those, that are call'd Factitious, to shew how much may be ascrib'd to, and perform'd by, the Mechanical Characterization or *Stamp* of Matter: Of which we have a noble Instance in Gunpowder, wherein by a bare comminution and blending the Ingredients, Nitre, Charcoal, and Brimstone, which have onely a new, and That an exceeding slight Contexture, each retaining its own Nature in the Mixture; so that there is no colour afforded to the pretence of a substantial Form, there is produc'd a new Body, whose Operations are more powerful and prodigious, then those of almost any Body of Natures own compounding. And though Glas be but an Artificial Concrete, yet, besides that 'tis a very noble and useful one, Nature her self has produc'd very few, if enough, to make up a Number more lasting and more unalterable. And indeed divers of those factitious Bodies,

Bodies that Chymistry is able to afford us, are endow'd with more various and more noble Qualities, then many of those, that are unquestionably Natural. And if we admit these Productions into the number of Natural Bodies, they will afford us a multitude of Instances, to shew, that Bodies may acquire many and Noble Qualities, barely by having Mechanical Affections, introduc'd by outward Agents into the Matter, or destroy'd there. As though Glass be such a Noble Body, as we have lately taken notice of, yet since tis Fusibility, Transparency, and Brittleness, that are its onely Constituent Attributes, we can in less then an hour, (or, perhaps halfe that time,) turn an Opacous Body into Transparent Glass, without the Addition of any other Visible Body, by a change of Texture, made in the same Matter, and by another change of Texture, made without Addition, as formerly, we can, in a trice, reduce Glass into, or

S

obtain

obtain from it a Body, not Glassy, but Opacous, and otherwise of a very differing Nature, as it had been before. And here let me adde what may not a little conduce to our present Design, That even those, that imbrace *Aristotle's* principles, do unawares confesse, that a slight change of Texture, without the introduction of a substantial Form, may not onely make a Specifical difference betwixt Bodies, but so vast a one, that they shall have differing *Genus'es*, and may (as the Chymists speak) belong to differing Kingdoms. For Coral, to pass by all other Plants of that kind, that may be mention'd to the same purpose, whilst it grows in the Bottom of the Sea, is a real Plant, and several times (which suffices for my present scope) hath been there found by an Acquaintance of mine, as well as by other Inquirers, soft and tender like another Plant. Nay, I elsewhere* bring ve-

* In the Essays about things supposed to be spontaneously generated.

ry good and recent Authority to prove, that it is oftentimes found very succulent, and does propagate its *species*, as well as other Shrubs; and yet Coral, being gather'd and remov'd into the Air, by the recess of its Soul, no new Lapidifick Form being so much as pretended to, turns into a Concretion, that is, by many Eminent Writers and others, reckon'd among Lapideous ones: as indeed Coral does not burn like Wood, nor obey Distillation like it; and not onely its *Calx* is very differing from the Ashes of Vegetables, and is totally soluble in divers acid Liquors, and even Spirit of Vinegar, but the uncalcin'd Coral its self will be easily corroded by good Vinegar, after the same manner as I have seen *Lapis stellaris*, and other unquestionably Mineral Stones dissolv'd, some by that Liquor, and some by the Spirit of it. A much stranger thing may be seen in the East-India Island of *Sombrero*, not very far from

Sumatra; if we may believe our Countryman *Sr James Lancaster*, who relates it as an Eye witnesse, for which reason, and for the strangeness of the thing, I shall adde the story in his own words. Here (*sayes he, speaking of the Coast of *Sombrero*) we found upon the sand by the Sea side, a small Twigge growing up to a young Tree, and offering to pluck up the same, it shrunk down into the ground, & sinketh, unless you hold very hard. And being pluck'd up, a great Worme is the Root of it: and look how the Tree groweth in greatnes, the VVorme diminisheth Now as soon as the VVorm is wholly turn'd into the Tree, it rooteth in the ground, and so groweth to be great. This Transformation was one of the greatest wonders I saw in all my Travels. This Tree being plucked up a little, the Leaves stripped off and the Pill, by that time it was dry turned into a hard Stone, much like to white Coral. So that (concludes he)

* Purchas. Pilgr. part. the first. p. 152.

this worme was twice transformed into different natures: of these we gather'd and brought home many. The Industrious *Piso*, in his Excellent History of *Brasil*, vouches a multitude of Witnesses (not having Opportunity to be one himself) for the ordinary Transformation of a sort of Animals (not much unlike Grass-hoppers) into Vegetables, at a certain season of the * year.

But since I late down this Relation of *S^r John Lancaster*, I have met with another, whose strangeness may much countenance it, in a small Tract newly publish'd by a Jesuite, *F. Michael Boym*, whom a good Critick much commended to me. For this Author doth, as an Eyewitness, affirme that, which is little lesse to my present Purpose. * *Levis*,

* The passage, which is long, I do not here transcribe, having had occasion to do it elsewhere. It is extant *Lib. 5. Cap. 21.* and at the close of his Narrative he subjoynes, *Non est, quod quisquam de veritate dubitet, cum infinitos testes habeat Brasilia, &c.*

* *Flora Sinensis ou Traite des Flerus &c.* under the title *Lozmeoques.*

i.e. I saw in a small fresh water, and shallow Lake of the Island Hainan, (which belongs to China) Crabs, or Crawfishes, which, as soon as they were drawn out of the water, did in a moment loose both Life and Motion, and became petrify'd, though nothing appear'd to be chang'd either in the External or Internal figure of their Bodies. What he further addes of these Fishes, is but of their Virtues in Physick, which, not concerning our subject, I shall (*Pyrophilus*) willingly prætermit it; and even, as to our Country-man's relation, hoping, by means of an Ingenious Correspondent in the East-Indies, to receive a further Information about the strange Plant he mentions, I shall, at present, urge onely what has been taken notice of concerning Coral, to countenance the Observation, for whose sake these Narratives have been alleadg'd. And so likewise, as to what I was saying of Glass, and Gunpowder, our receiving of those and the
gene.

generality of Factitious Bodies into the Catalogue of Natural Bodies, is not (which I formerly also intimated) necessary to my present Argument: whereto it is sufficient; that Vitriol is granted on all hands to be a Natural Body, though it be also producible by Art. And also to the Argument it affords us, we might adde that memorable Experiment deliver'd by *Helmont*, of turning Oyl of Vitriol into Allom, by the Odour (as he calls it) of Mercury, if, however it be not despicable, we had found it fit to be rely'd on. But reserving an Account of that for another place, we shall substitute the Instance, presented us by our Author, about the Production of Salt-petre: for if, having dissolv'd Pot.ashes in fair water, you coagulate the filtered Solution into a white Salt, and on that pour Spirit of Nitre, till they will not hiss any longer together, there will shoot, when the superfluous water is Evaporated, Christs, that proclaim

their Nitrous Nature by their Prismatical, (or at least Prisme-like) Shape, their easie Fusion, their Accension, and Deflagration, and other Qualities, *partly* mention'd by our Author, and *partly* discoverable by a little Curiosity in making Tryals.

II.

Experimental Attempts about the Redintegration of Bodies.

THe former of those two Arguments, (*Pyrophilus*) by which I propos'd to confirm the Origine of Forms, was, as you may remember, grounded upon the Manner, by which such a Convention of Accidents, as deserves to passe for a Form, may be produc'd: and That having been hitherto
pro-

prosecuted, it now remains, that we proceed to the Second Argument, drawn, not (as the former) from the first Production, but from the Reproduction of a Physical Body. And though both these Arguments are valid; yet if this Latter could, in spite of the Difficulties intervening in making of the Experiments that belong to it, be as clearly made out as the former, you would, I suppose, like it much the better of the two. For if we could Reproduce a Body, which has been depriv'd of its substantial Form, you would, I presume, think it highly probable, if not more then probable, that (to borrow our Author's Expression) That which is commonly call'd the Form of a Concrete, which gives it its Being and Denomination, and from whence all its Qualities are in the Vulgar Philosophy, by I know not what inexplicable waies, suppos'd to flow; may be in some Bodies but a Characterization or Modification

cation of the Matter they consist of; whose parts, by being so and so dispos'd in relation to each other, constitute such a determinate kind of Body, endow'd with such and such Properties, whereas, if the same parts were otherwise dispos'd, they would constitute other Bodies, of very differing Natures from that of the Concrete, whose parts they formerly were, and which may again result or be produc'd, after its dissipation, and seeming destruction, by the Reunion of the same component Particles, associated according to their former Disposition.

But though it were not Impossible to make an adæquate Redintegration of a Chymically Analiz'd Body, because some of the dissipated parts will either escape through the Juncures of the Vessels, (though diligently clos'd,) or, if they be very subtle, will fly away upon the disjoyning of the Vessels; or, will irrecoverably stick to the inside of them:

them: yet I see not, why such a Reproduction, as is very possible to be effected, may not suffice to manifest what we intend to make out by it. For, even in such Experiments, it appears, that when the Form of a Natural Body is abolish'd, and its parts violently scatter'd; by the bare Reunion of some parts after the former manner, the very same Matter, the destroy'd Body was before made of, may, without Addition of other Bodies, be brought again to constitute a Body of the *like Nature* with the former, though not of *equal Bulk*. And indeed, the Experiment, recorded by our Author, about the Reproduction of Salt Petre, as it is the best and successlesfullest I have ever been able to make upon Bodies, that require a strong Heat to dissipate them; so I hope it will suffice to give you those thoughts about this matter, that the Author design'd in alledging it; and therefore, though having premis'd thus much, I shall proceed to acquaint

acquaint you with the success of some Attempts he intimates (in that Essay) his Intention of making, for the Redintegration of some Bodies; yet doing it onely out of some Historical Notes I find among my loose Papers, That, which I at present pretend to, is, but *partly* to shew you the *difficulty* of such Attempts, which, since our Author's Essay was communicated, have been represented (I fear by Conjecture onely) as *very easie* to be accurately enough done; and *partly*, because our Author does not, without reason, intimate the usefulness of Redintegrations, in case they can be effected; and does, not causelessly, intimate, that such Attempts, though they should not Perfectly succeed, may increase the Number of Noble and Active Bodies, and consequently, the Inventory of Mankind's Goods. Upon such Considerations we attempted the Dissipation and Reunion of the parts of common Amber; and though

Chymists,

Chymists, for fear of breaking their Vessels, are wont, when they commit it to distillation, to adde to it a *caput mortuum* (as they speak) of Sand, Brick, &c. (in whose room we sometimes choose to substitute beaten Glais;) which hinders them to judge of and employ the Remanence of the Amber, after the Distillation is finish'd: yet we suppos'd, and found, that if the Retort were not too much fill'd, and if the Fire were slowly and warily enough administer'd, the Addition of any other Body would be needless. Wherefore having put into a Glais Retort four or five Ounces of Amber, and administred a gentle and gradual heat, we observ'd the Amber to melt and bubble, (which we therefore mention, because ingenious men have lately questioned, whether it can be melted,) and having ended the Operation, & sever'd the vessels, we found, that there was come over in the form, partly of Oyl, partly of Spirit & Flegm, and partly of
volatile

volatile Salt, near half the weight of the Concrete: and having broken the Retort, we found, in the bottom of it, a Cake of coal-black Matter, then whose upper surface I scarce remember to have seen in my whole life any thing more exquisitely polish'd; in so much, that, notwithstanding the Colour, as long as I kept it, it was fit to serve for a Looking Glass: and this smooth Mass being broken, (for it was exceeding brittle,) the larger fragments of it appear'd adorn'd with an excellent lustre. All those parts of the Amber, being put together into a Glass Body, with a blind head luted to it, were placed in Sand, to be incorporated by a gentle heat: but whilst I slept aside to receive a Visit, the Fire having been increas'd without my knowledge, the Fumes ascended so copiously, that they lifted up the Vessel out of the Sand, whereupon falling against the side of the Furnace, it broke at the top, but, being seasonably call'd, we

we sav'd all but the Fumes; and the re-
 maining Matter looks not unlike Tarre,
 and with the least heat may be powr'd
 out like a Liquor, sticking even when it
 is cold to the fingers. Yet this open'd
 Body doth not easily communicate so
 much as a Tincture to spirit of Wine,
 (which therefore seems somewhat
 strange, because another time presume-
 ing, that this would be a good way to
 obtain a Solution of some of the resi-
 nous parts of Amber, we did, by pou-
 ring spirit of Wine, that (though recti-
 fy'd) was not of the very best, upon the
 reunited parts of Amber, lightly dige-
 sted into a Mass, easily obtain a clear
 Yellow Solution, very differing from
 the Tincture of Amber, and abounding
 (as I found by Tryal) in the dissolv'd
 substance of the Amber:) but in Oyl of
 Turpentine we have, in a short time, dis-
 solv'd it into a bloud red Balsome, which
 may be of good use (at least) to Chi-
 rurgions. And having agen made the
 former

former Experiment with more wariness then before, we had the like success in our Distillation, but, the reunited parts of the Amber being set to digest in a large Bolt head, the Liquor that was drawn off, did, in a few hours, from its own *Caput mortuum* extract a bloud red Tincture, or else made a Solution of some part of it, whereby it obtain'd a very deep Red; but having been, by intervening Accidents, hindred from finishing the Experiment, we mist the Satisfaction of knowing to what it may be brought at last.

And as for what our Author tels us of this design to attempt the Redintegration of Vitriol, Turpentine, and some other Concretes, wherein it seem'd not unpracticable, he found in it more difficulty then every one would expect. For the Bodies, on which such Experiments are likeliest to succeed, seem to be Allom, Sea salt, and Vitriol. And as for Allom, he found it a troublesome work

work to take (as a Spagirist would speak) the Principles of it asunder, in regard, that it is inconvenient to distill it with a *Caput mortuum*, (as Chymists call any fix'd Additament,) lest that should hinder the desir'd Redintegration of the dissipated parts: And when he distill'd it by its self, without any such Additament, he found, that, with a moderate heat, the Allom would scarce part with any thing but its Phlegm, and if he urg'd it with a strong fire, he found, it would so swell, as to endanger the breaking of the Retort, or threaten the boiling over into the Receiver. (Yet having once been able very warily to abstract as much Flegm and Spirit, as I conveniently could, from a parcel of Roch Allom, and having powr'd it back upon that pulveriz'd *caput mortuum*, and left the vessel long in a quiet place, I found, that the Corpuscles of the Liquor, having had time, after a multitude of Occursions, to accommodate and re-

T

unite

unite themselves to the more fix'd parts
 of the Concrete, did by that Associati-
 on (or Dissolution) recompose, at the
 top of the Powder, many Christalline
 Grains of finely figur'd Salt, which in-
 creasing with time, made me hope, that, at
 the length, the whole or the greatest part
 would be reduc'd into Allom, which yet
 a Mischance, that robb'd me of the Glass,
 hindred me to see.) So likewise of Sea
 salt, if it be distill'd, as it is usual,
 with thrice its weight of burn'd Clay, or
 beaten Brick, twill prove inconvenient
 in reference to its Redintegration; and
 if it be distill'd alone, it is apt to be fluxt
 by the heat of the fire, and, whilst it re-
 mains in Fusion, will scarce yield any
 Spirit at all. And as for Vitriol, though
 the Redintegration of it might seem to
 be less hopeful, then that of the other
 Salts, in regard that it consists not one-
 ly of a Saline, but of a Metalline Body,
 whence it may be suppos'd to be of a
 more intricate and elaborate Texture:
 yet

yet because there needs no *caput mortuum* in the Distillation of it, we did, to pursue our Author's intimated designs, make two or three Attempts upon it, and seem'd to miss of our Aime, rather upon the Account of accidental hindrances, then of any insuperable difficulty in the thing it self. For once, we with a strong fire, drew off from a parcel of common blew Vitriol, the Phlegm and Spirit, and some quantity of the heavy Oyl, (as Chymists abusively call it:) These Liquors, as they came over without Separation, we divided into several parts, and the remaining very red *Caput mortuum* into as many. One of these parcels of Liquor we poured over night upon its correspondent portion of the newly mentioned red Powder. But having left it in a Window, and the Night proving very bitter, in the morning I found the Glass crack'd in many places by the violence of the Frost, and the Liquor seem'd to have been soak'd

up by the Powder, and to have very much swelled it. This mixture then I took out, and placing it in an open mouth'd Glass in a Window, I found, after a while, divers Grains of pure Vitriol upon the other Matter, and some little Swellings, not unlike those we shall presently have Occasion to speak of. I took likewise a much larger parcel of the forementioned Liquor, and its correspondent proportion of *Caput mortuum*; and having leisurely mixt them in a large Glass Bason, I obtain'd divers *Phaenomena*, that belong not to this place, but may be met with, where they will more properly fall in. In this Bason (which I lay'd in the Window, and kept from Agitation,) I perceived, after a while, the Liquor to acquire a blewish Tincture, and after ten or twelve weeks, I found the mixture dry, (for, it seems, it was too much exposed to the Air:) but the Surface of it adorn'd in divers places with Grains of Vitriol very curiously

riously figur'd. And besides these, there were store of Protuberances, which consisted of abundance of small vitriolate particles, which seem'd in the way to a Coalition; for having let the Bason alone for four or five months longer, the Matter appear'd crusted over, partly with very elevated Saline protuberances, partly with lesser parcels, and partly also with considerably broad Cakes of Vitriol, some of above half an Inch in breadth, and proportionably long; and indeed the whole surface was so odly diversifi'd, that I cannot count the trouble, these Tryals have put me to, mispent. Another time in a more slender and narrow mouth'd Glass I pour'd back upon the *Caput mortuum* of Vitriol the Liquors, I had by violence of the fire forc'd from it; so that the Liquid part did swim a pretty height above the red *Calx*, and remain'd a while limpid and colourless: but the vessel having stood, for some time, unstop'd in a Window,

the Liquor after a while, acquir'd by degrees a very deep vitriolate colour, and not long after, there appear'd, at the bottom and on the top of the *Calx*, many fair and exquisitely figur'd Grains of Vitriol, which cover'd the surface of the *Calx*; and the longer the vessel continu'd in the Window, the deeper did this Change, made upon the upper part of the Powder, seem to penetrate: so that I began to hope, that, in process of time, almost (if not more then almost) the whole mixture would be reduc'd to perfect Vitriol. But an Accident robb'd me of my Glass, before I could see the utmost of the Event.

And, on this Occasion, I must not prætermitt an odd Experiment I lately made, though I dare not undertake to make it agen. I elsewhere relate, how I digested, for divers weeks, a Quantity of powder'd Antimony, with a greater weight by half of Oyl of Vitriol, and how having at length committed this
mix-

mixture to Distillation, and thereby obtained, besides a little Liquor, a pretty quantity of combustible Antimonial or Antimonio-Virriolate Sulphur; there remained, in the bottom of the Retort, a somewhat light and very friable *Caput mortuum*, all the upper part of which was at least as white as common Wood-ashes, and the rest look'd like a Cinder. And now I must tell you what became of this *Caput mortuum*, whereof I there make no further mention. We could not well foresee what could be made of it, but very probable it was, that it would afford us some new Discovery, by being expos'd to the fire, in regard of the copious Sulphur, whereof it seem'd to have been deprived: provided it were urg'd in close Vessels, where nothing could be lost. Whereupon committing it to a naked fire in a small glass Retort, well Coated, and accommodated with a Receiver, we kept it there many hours, and at length severing the

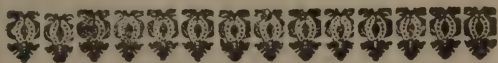
Vessels, we found (which need not be wonder'd at) no Antimonial Quick-silver, and much less of Sulphur sublim'd then we expected: wherefore greedily hastning to the *Caput mortuum*, we found it flux'd into a Mass, covered with a thin Cake of Glass, whose fragments being held against the light, were not at all coloured, as Antimonial Glass is wont to be, but were as colourlesse as common white Glass. The Lump above mentioned being broken, was found, somewhat to our wonder, to be perfect black Antimony, adorn'd with long shining streaks, as common Antimony is wont to be: onely this Antimony seem'd to have been a little refin'd by the sequestration of its unnecessary Sulphur; which Ingredient seems by this Experiment, as well as by some other Observations of ours, to be more copious in some particular Parcels of that Mineral, then is absolutely requisite to the constitution of Antimony. Though
in

in our case it *may* be suspected, that the reduction of part of the Mass to a colourless Glass, was an effect of the Absence of so much of the Sulphur, and might *in part* make the remaining Masse some amends for it. What we further did with this new or reproduced Concrete, is not proper to be here told you: onely, for your satisfaction, we have kept a Lump of it, that you may, with us, take notice of what some Philosophers would call the Mindfulness of Nature, which, when a Body was deprived of a not inconsiderable portion of its chiefe Ingredient, and had all its other parts dissipated, and shuffled, and discolour'd, so as not to be knowable, was able to rally those scatter'd and disguised parts, and Marshal or dispose them into a Body of the former Consistence, Colour, &c. though (which is not here to be overlook'd) the Contexture of Antimony, by reason of the copious shining *Styria*, that enoble the darker Body, be
much

much more elaborate, and therefore more uneasie to be restored, then that of many other Concretes.

But among all my Tryals about the Redintegration of Bodies, That which seem'd to succeed best, was made upon Turpentine: for having taken some Ounces of this, very pure, and good, and put it into a Glass Retort, I distill'd so long with a very gentle fire, till I had separated it into a good quantity of very clear Liquor, and a *Caput mortuum* very dry and brittle: then breaking the Retort, I powder'd the *Caput mortuum*, which, when it was taken out, was exceeding sleek, and transparent enough, and very Red; but being powder'd, appear'd of a pure Yellow colour. This Powder I carefully mixt vvith the Liquor, that had been distill'd from it, vvhich immediately dissolv'd part of it into a deep red Balsam; but by further Digestion in a large Glass exquisitely stop't, that Colour began to grow fainter,

ter, though the remaining part of the Povvder, (except a very little proportionable to so much of the Liquor, as may be suppos'd to have been vvaſted by Evaporation, and Transfusion out of one Veſſel into another,) be perfectly diſſolv'd, and ſo well reunited to the more fugitive parts of the Concrete, that there is ſcarce any, that by the ſmell, or taſt, or conſiſtence, vvould take it for other then good and laudable Turpentine.



THE



*The I. Section of the Historical
Part (containing the Observations,
and beginning at pag. 107.) is mis-
plac'd, and ought to have come in here,
and have immediately preceded this II. Se-
ction containing the Experiments.*



ADVERTISEMENT *about the ensuing* II. SECTION.

THE Author would not have the Reader think, that the following Experiments, are the sole ones that he could have set down to the same purpose with them. For they are not the only that he had actually laid aside for this occasion, till judging the ensuing ones sufficient for his present scope, he thought it fitter to reserve Others for those Notes about the Production of particular Qualities, to which they seem'd properly to belong. Perhaps also it will be requisite for me (because some Readers may think the Omission a little strange) to excuse my having left divers particulars unmentioned in more then One of the ensuing Experiments. And I confesse that I might easily enough both have taken notice of more Circumstances in them, and made far more Reflections on them, if I would have expatiated on the several Experiments according to the Directions deliver'd in other* Papers, But though there, where twas my Design to give employment to the Curiosity and Diligence of as many Volaries to Nature, as (for want of better instructions) had a mind to be so set on work, it was fit the proposed Method should be suitable; yet here, where I deliver Experiments, not so much as parts of Natural History, as instances to confirm the Hypotheses, and Discourses they are annexed to; it seem'd needlesse, and improper, (if not impertinent,) to set down Circumstances, Cautions, Inferences, Hints, Applications, and other Particulars, that had no tendency to the scope, for which the Experiments were alledged.

* Containing some Advices and Directions for the writing of an Experimental Natural History.

☞ These two Leaves are to be placed immediately before the 271 page.

Advertisements about

And as for the kind of Experiments, here made choice of, I have the less scrupled to pitch upon Chymical Experiments, rather then Others on this occasion; not onely because of those Advantages which I have ascribed to such Experiments in the latter part of the Preface * to my Specimens, but because I have been Entouraged by the success of the Attempt made in those Discourses. For as new as it was when I made it four or five years ago, and as unusual a Thing as it could seem to divers Atomists and Cartesians, That I should take upon me to Confirm and Illustrate the Notions of the Particularian Philosophy (if I may so call it) by the help of an Art, which many were pleas'd to think cultivated but by Illiterate Operators, or whimsical Phanticks in Philosophy, and useful onely to make Medicines, or Disguize Metals: yet these Endeavours of ours met with much lesse opposition, then new Attempts are most commonly fain to struggle with. And in so short a time I have had the happiness to engage both divers Chymists to learn and relish the Notions of the Corpuscular Philosophy, and divers eminent Embracers of That, to endeavour to illustrate and promote the New Philosophy, by addresting themselves to the Experiments, and perusing the Books of Chymists. And I acknowledge, it is not unwelcome to me to have been (in some little measure) instrumental to make the Corpuscularian Philosophy, assisted by Chymistry, preferred to that which has so long obtained in the Schools. For (not here to consider, which I elsewhere do, how great an Advantage That Philosophy hath of This, by having an advantage of it in point of clearness,) though divers Learned and worthy men, that knew no better Principles, have, in cultivating the Peripatetick Ones, abundantly exercised and displaid their own Wit: yet I fear they have very little,

* The Preface, here mentioned, is that premittid to the Tract intituled—*Some Specimens of an Attempt to make Chymical Experiments useful to illustrate the Notions of the Corpuscular Philosophy.*

The ensuing II. Section.

if at all, improved their Readers Intellect, or enrich'd it with any true or useful Knowledge of Nature; but have rather taught him to Admire Their Subtlety, then understand Hers. For to ascribe all particular Phenomena, that seem any thing Difficult, (for abundance are not thought so, that are so,) to substantial Forms, and, but nominally understood, Qualities, is so general and easie a way of resolving Difficulties, that it allows Naturalists, without Disparagement, to be very Careless and Lazy, if it do not make them so: as in effect we may see, that in about 2000 years since Aristotles time, the Adorers of his Physics, at least by vertue of His peculiar Principles, seem to have done little more more then wrangle, without clearing up (that I know of) any mystery of Nature, or producing any useful or noble Experiments: whereas the Cultivators of the Particularian Philosophy, being obliged by the nature of their Hypothesis, and their way of Reasoning, to give the particular Accounts and Explications of particular Phenomena of Nature, are also obliged, not onely to know the general Laws and Course of Nature, but to enquire into the particular Structure of the Bodies they are conversant with, as that wherein, for the most part, their Power of acting, and Disposition to be acted on, does depend. And in order to this, such Enquiries must take notice of Abundance of Minute Circumstances; and to avoid mistaking the Causes of some of them, must often Make and Vary Experiments; by which means Nature comes to be much more diligently and industriously Studied, and innumerable Particulars are discover'd and observed, which in the Lazy Aristotelian way of Philosophizing would not be Heeded. But to return to that Decad of Instances, to which these Advertisements are premised; I hope I need not make an Apology for making choice rather of Chymical Experiments, then others, in the second and concluding

Section

Advertisements &c.

Section of the Historical Part of the present Treatise. But though I prefer that Kind of Instances, yet I would not be thought to overvalue Them in their kind, or to deny, that some Artists may (for ought I know) be found, to whose Chymical Arcana, these Experiments may be little better than Trifles. Nor perhaps are these the considerablest, that I myself could easily have communicated; (though these themselves would not be now Divulged, if I would have been ruled by the Disswasions of such as would have nothing of Chymical made Common, which they think Considerable.) But things of greater Value in themselves, and of Noble Use in Physick, may be less Fit for our present purpose, (which is not to impart Medicinal, or Alchymistical Processes, but illustrate Philosophical Notions,) then such Experiments as these; which, besides that they containe Variety of Phenomena, do not (for the most part) require either much Time, or much Charge, or much Skill.



The II. SECT.



The II. SECTION,
containing the
EXPERIMENTS.

Experiment 1.

TAKE good and clear Oyl of Vitriol,
and cast into it a convenient quantity
of good Camphire grossly beaten;
let it float there a while, and, without the
help of external heat, it will insensibly
be resolv'd into a Liquor, which, from
time to time, as it comes to be produc'd,
you may, by shaking the Glass, mingle
with the Oyl of Vitriol, whereunto you
may, by this means, impart first a fine
Yellow, and then a colour, which though
it be not a true Red, will be of kin to it,
and so very deep, as to make the mixture
almost quite Opacous. When all
the

the Camphire is perfectly dissolv'd by incorporating with the Menstruum, if you hit upon good Ingredients, and upon a right Proportion, (for a slight Mistake in either of them, may make this part of the Experiment miscarry,) you may probably obtain such a mixture, as I have more then once had, namely, such a one, as not onely to me, whose sense of Smelling is none of the Dullest, but also to others, that knew not of the Experiment, seem'd not at all to have an Odour of the Camphire. But if into this Liquor you pour a due quantity of fair Water, you will see (perhaps not without delight) that, in a trice, the Liquor will become pale, almost as at the first, and the Camphire, that lay conceal'd in the pores of the Menstruum, will immediately disclose it self, and emerge, in its own nature and pristine form of white floating and combustible Camphire, which will fill not the Viol onely, but the neighbouring
part

part of the Air with its strong and Diffusive Odour.

Now the *Phænomena* of this Experiment may, besides the uses we elsewhere make of it, afford us several particulars pertinent to our present purpose.

I. For (first) we see a lighter and consistent Body brought, by a Comminution, into Particles of a certain figure, to be kept swimming, and mixed with a Liquor, on which it floated before, and which is, by great odds, heavier then it self: so that as by the Solution of Gold in *Aqua regis*, it appears, that the ponderouset of Bodies, if it be reduc'd to parts minute enough, may be kept from sinking in a Liquor much lighter then it self: So this Experiment of Ours manifests what I know not whether hitherto Men have prov'd, That the Corpuscles of Lighter Bodies may be kept from emerging to the Top of a much heavier Liquor: which Instance being added to that of the Gold, may teach us, that,

vvhhen

when Bodies are reduc'd to very minute parts, we must as well consider their particular Texture, as the receiv'd Rules of the Hydrostaticks, in determining whether they will sink, or float. or swim.

II. This Experiment also shews, that several Colours, and even a very deep one, may soon be produc'd by a White Body, and a clear Liquor, and that without the intervention of fire, or any external heat.

III. And that yet this Colour may, almost in the twinkling of an Eye, be destroy'd, and as it were annihilated, and the Latitant Whiteness, as many would call it, may be as suddainly restor'd by the Addition of nothing but fair Water, vvhich has no Colour of its ovvn, upon vvhose account it might be surmis'd to be contrary to the perishing colour, or to heighten the other into a Prædominancy: nor does the Water take into its self, either the Colour it destroy'd, or That it restores, For

IV.

IV. The more then semi-opacity of the Solution of Camphire and Oyl of Vitriol does presently vanish; and that Menstruum, with the Water, make up (as soon as the Camphorate Corpuscles come to be a float) one transparent and colourless Liquor.

V. And tis worth noting, that upon the mixture of a Liquor, which makes the Fluid much Lighter, (for so Water is in respect of Vitriol,) a Body is made to emerge, that did not so, when the Fluid was much heavier. This Experiment may serve to countenance what we elsewhere argue against the Schools, touching the Controversie about Mistion. For whereas though some of them dissent, yet most of them maintain, that the Elements alwaies loose their Forms in the mix'd Bodies they constitute; and though if they had dexterously propos'd their Opinion, and limited their Assertions to some cases, perhaps the Doctrine might be tolerated: yet since
 V. they

they are wont to propose it crudely and universally, I cannot but take notice, how little tis favour'd by this Experiment; wherein even a mix'd Body (for such is Camphire) doth, in a further mifstion, retain its Form and Nature, and may be immediately so divorced from the Body, to which it was united, as to turn, in a trice, to the manifest Exercise of its former Qualities. And this Experiment being the easiest Instance, I have devis'd, of the preservation of a Body, when it seems to be destroy'd, and of the Recovery of a Body to its former Conditions; I desire it may be taken notice of, as an instance I shall after have Occasion to have recourse to, and make use of.

VI. But the notablest thing in the Experiment is, that Odours should depend so much upon Texture, that one of the subtlest and strongest sented Drugs, that the East it self or indeed the World affords us, should so soon quite

quite loose its Odour, by being mix'd with a Body that has scarce, if at all, any sensible Odour of its own, and This, while the Camphorate Corpuscles survive undestroy'd, in a Liquor, from whence one would think, that lesse subtle and fugitive Bodies, then they, should easily exhale.

VII. Nor is it much lesse considerable, that so strong and piercing a Sent as that of Camphire, should be, in a moment, produc'd in a Mixture, wherein none of it could be perceiv'd before, by such a Liquor as Water, that is quite devoid of any Odour of its own: which so easie and suddain restauration of the Camphire to its Native Sent, as well as other Qualities, by so languid a Liquor as common Water, doth likewise argue, that the Union or Texture of the two Ingredients, the Camphire and the Oyl of Vitriol, was but very slight, upon which neverthelesse a great alteration in point of Qualities depended. And to con-

firme, that divers of the præceding *Phæ-*
nomena depend upon the particular Tex-
 ture of the Liquors, imploy'd to exhibit
 them, I shall add, that if, instead of oyl of
 Vitriol, you cast the Concrete into well
 deflegm'd Spirit of Nitre, you will ob-
 tain no red, nor dark, but a Transparent
 and Colourless Solution. And when
 to the above mention'd red Mixture I
 put, instead of fair Water, about 2 or 3
 parts of duely rectifi'd Spirit of Wine,
 there would ensue no such changes, as
 those formerly recited; but the Spirit
 of Wine, that dissolv'd the Concrete,
 when it was by it self, without loosing
 its Diaphaneity, or acquiring any Co-
 lour, did, when it dissolv'd the Mix-
 ture, dissolve it with its new adventiti-
 ous Colour, looking like a gross red
 Wine, somewhat turbid, or not yet well
 freed from its Lees: so that this Colour
 appear'd to reside in the Mixture as
 such, since neither of the two Ingredi-
 ents dissolv'd in, or mingled vvith the
 Spirit

Spirit of Wine, would have afforded that Colour, or indeed any other. But if to this Liquer, that look'd like troubled Wine, we poured a large Proportion of fair Water, the Redness would immediately vanish, and the Whole would, *as to sense*, become White throughout; I say, *as to sense*, because the Whitenesse did not indeed appertain properly to the whole Mixture, but to a huge multitude of little Corpuscles of the reviv'd Concrete, whereof some or other, which at first swamme confusedly to and fro, left no sensible Portion of the Liquor unfurnish'd with some of them; whereas when the Camphorate Corpuscles had leisure to emerge, as they soon did, they floated in the forme of a White Powder or Froth at the top of the Liquor, leaving all the rest as clear and colourlesse as the common Water.

But we have not yet mention'd all the use, we design'd to make of our

Mixture, for by prosecuting the Experiment a little further, we made it afford us some new *Phænomena*.

VIII. For having kept the Mixture in a moderately warme place, (which circumstance had perhaps no influence on the Success,) and having distill'd it out of a Glass Retort, the Event answer'd our Expectation, and the Liquor, that came over, had a Sent; which, though very strong, was quite differing both from that of the Mixture, and that of the Camphire; and in the remaining Body, though the Liquor and the Camphire it consisted of, were either both transparent, or the one transparent as a Liquor, and the other white, as transparent and colourlesse Bodies are wont to be made by Contusion: yet the remaining Mass, which amounted to a good part of the Mixture, was not only Opacous, but as black as Coal, in some places looking just like polished Jet;

Jet; which is the more considerable, because that though Vegetable Substances, that are not fluid, are wont to acquire a Blackness from the fire, yet neither do Liquors, that have already been distill'd, obtain that Colour upon Redistillation; neither have we, upon Tryal purposely made, found, that Camphire, expos'd to fire in a Retort, fitted with a Receiver, (which was the case of the present Experiment,) would at all acquire a Jetty Colour; but would either totally ascend White, or afford *Flores*, and a *Caput mortuum* (as a vulgar Chymist would call the Remaines) of the same Colour, both in respect of one another, and in respect of the Camphire.

IX. And our Experiment afforded this notable *Phænomenon*, That though Oyl of Vitriol be a distill'd Liquor, and though Camphire be so very fugitive a Substance, that being left in the Air, it will, of it self, fly all away; and therefore

Physicians and Druggists prescribe the keeping it in Linseeds or *Millium*, or other convenient Bodies, to hinder its Avolation; yet, by our Experiment, its Fugacity is so restrain'd, that not onely the *Caput mortuum* newly mention'd, endured a good fire in the Retort, before it was reduc'd to that pitchy Substance vve vvere lately mentioning, but having taken some of that substance out of the Retort, & order'd it, by a careful Workman, to be kept in a closely cover'd Crucible during some time in the fire; when it vvas brought me back, after the Pot had been kept red hot above half an hour, there remain'd a good quantity of the Matter, brittle, vvithout any smell of Camphire, and as black as ordinary Charcoal, so much do the Fixity and Volatility of Bodies depend upon Texture.

Experiment.

Experiment II.

Among those other Experiments of mine, (*Pyrophilus*) which tend to manifest, that new Qualities may be produc'd in Bodies, as the Effects of new Textures; I remember, some years ago, I writ for a Friend a whole Set of Tryals, that I had made about the Changes I could produce in Metals and Minerals, by the Intervention of Sublimate. But though the whole Tract, wherein they are recited, might be pertinent enough to our present Subject; yet reserving other passages of it for other places, (especially for our Notes upon those particular Qualities, which they are most proper to illustrate,) it may at this time suffice me to send you a Transcript of what that Account contains, relating to Copper and Silver, the one a mean and fugitive, and the other a noble and fix'd Metal. For those changes
in

Coloſur, Conſiſtence, Fuſibleneſſe, and other Qualities, which you will meet with in theſe Experiments, will afford us divers *Phænomena*, to ſhew what great Changes may be made, even in Bodies ſcarce corruptible, by one or more of thoſe three Catholick wayes of Natures working according to the Corpuscular Principles, namely, the Acceſs, the Recess, and the Tranſpoſition of the minute Particles of Matter.

As for my Method of changing the Texture of Copper, I confeſs it hath oftentimes ſeem'd ſtrange to me, that Chymiſts, plainly ſeeing the notable Effect, that Sublimate, diſtill'd from Antimony, has upon that Mineral, by opening it, and volatilizing it, (as we ſee it do in the making of what they are pleas'd to call *Mercurius vita*,) ſhould not have the Curioſity to try, whether or no Sublimate might not likewise produce, if not the ſame, yet a conſiderable

rable Change in other Mineral Bodies;
 there appearing no reason, or at least
 there having been none given, that I
 know of, why the Refserating Operati-
 on (if I may so speak) of Sublimate,
 should be confin'd to Antimony. Up-
 on these Considerations, we were in-
 vited to endeavour to supply the Neg-
 lect we had observ'd in Chymists, of
 improving the Experiment of *Butyrum*
Antimontii: and though an Indisposition
 in point of Health, which befell us be-
 fore we had made any great progress in
 our Enquiries, made us so shy of the
 Fumes of Sublimate and Minerals, that
 we neither did make all our Tryals so
 accurately, nor prosecute them so far as
 we would have done, had we been to
 deal with more innocent Materials: Yet
 we suppose, it will not be unwelcome
 to You, to receive from us a naked, but
 faithful, Narrative of our Proceedings;
 being apt to think, that you will there-
 in find Inducements to carry on this
 Expe-

Experiment further then we have done, and to compleat what we have but begun.

First then, we took half a pound of Copper plates, of about an Inch broad, and the thickness of a Grain of Wheat, (which we after found was too great,) and of an arbitrary length; then casting a Pound of grossly beaten *Venetian* Sublimate into the bottom of a somewhat deep Glass Retort, we cast in the Copper plates upon it, that the Fumes of the Sublimate might, in their Ascension, be compell'd to act upon the incumbent Metal, and then placing this Retort, as deep as we well could, in a Sand Furnace, and adapting to it a small Receiver, we administer'd a Gradual fire seven or eight hours, and at length for a while increas'd the heat, as much as we well could do in such a Furnace. The success of this Operation was as follows.

1. There came little or no Liquor at all over into the Receiver, but the Neck & upper

upper part of the Retort were Candied on the inside, by reason of the copious Sublimate adhæring to them, which Sublimate weigh'd above Ten Ounces; in the Retort we found about two Ounces and a quarter of running Mercury, which had been suffer'd to revive by the acid Salts, which corroding the Copper, forsook the Quicksilver, whereto they had been in the Sublimate united.

2. Upon the increase of the fire, there was plainly heard a Noise, made by the melting Matter in the Retort, not unlike that of a boiling Pot, or of Vitriol, when being committed to a Calcining fire, it is first brought to flow. And this Noise we found to be a more constant Circumstance of this Experiment, then the revivification of part of the Mercury contain'd in the Sublimate, for upon another Tryal, made with the former proportion of Copper plates and Sublimate, we observ'd, during a very long while, such a Noise as hath been already
men-

mention'd, but the Operation being finish'd, we scarce found so much as a few Grains of running Mercury, either in the Retort or Receiver.

3. We found the Metalline Lump, in the bottom of the Retort, to have been increas'd in weight somewhat more then (though not half an Ounce above) two Ounces; some of the Copper plates, lying at the bottom of the Mass, retain'd yet their Figure and Malleableness, which we ascrib'd to their not having been thin enough to be sufficiently wrought upon by the Sublimate: the Others, which were much the greater number, had wholly lost their Metalline form, and were melted into a very brittle Lump, which I can compare to nothing more fitly, then a lump of good Benjamin, for this Mass, though ponderous, was no less brittle, and being broken, appear'd of divers Colours, which seem'd to be almost transparent, in some places it was red, in others of a high

high and pleasant Amber Colour, and in other parts of it, Colours more darkish and mix'd might be discern'd.

4. But this strange Mass being broken into smaller Lumps, and laid upon a Sheet of White Paper in a Window, was, by the next morning, where ever the Air came at it, all cover'd with a lovely greenish Blew, or rather, blewish Green, almost like that of the best Verdegrees, and the longer it lay in the air, the more of the internal parts of the Fragments did pass into the same Colour: but the vvhite Paper, which in some places they stain'd, seem Dy'd of a Green colour inclining unto Yellow. And here we had Occasion to take notice of the insinuating subtlety of the Air; for having put some pieces of this Cupreous Gum (if I may so call it) into a little Box, to shut out the Air, which vve have found it possible to exclude by other means, vve found, that notwithstanding our care, those included
Fragments

Fragments were, as well as the rest already mention'd, covered with the powder, as it were of *viride Aris*.

5. We must not, on this Occasion, omit to tell you, that, having, the last year, made some Tryals in reference to this Experiment, we observ'd in one of them, that some little Copper plates, from which Sublimate had been drawn off, retain'd their pristine shape, and Metalline nature, but were Whitened over like Silver, and continu'd so for divers Months, (though we cannot precisely tell you how long, having at length accidentally lost them.) And to try whether this Whiteness were only superficial, we purposely broke some of these flexible Plates, and found, that this Silver colour had penetrated them throughout, and was more glorious in the very Body of the Metal, than on its Surface, which made us suspect, that the Sublimate, by us imploy'd, had been adulterated with Arsenick, (vvhere-
vvith

with the Sophisticators of Metals are wont to make Blanchers for Copper, but not to mention, that the Malleableness continu'd, which Arsenick is wont to destroy, we discover'd not by Tryal, that the Sublimate was other then sincere.

6. In this Metalline Gum the Body of the Copper appear'd so chang'd and open'd, that we were invited to look upon such a Change as no ignoble Experiment, considering the Difficulty, which the best Artists tell us there is, and which those, that have attempted it, have found, I say not, to unlock the Sulphur of Venus, but to effect lesse Changes in its Texture, then was hereby made. For this Gum, cast upon a quick Coal, and a little blown, will partly melt and flow like Rosin, and partly flame, and burn like a Sulphur, and with a flame so lasting, if it be re-kindled as often as it leaves off burning, that we observ'd it, not without some

X

Wonder;

Wonder; and so inflammable is this opened Copper, that, being held to the flame of a Candle, or a piece of lighted Paper, it would almost in a moment take fire, and send forth a flame like common Sulphur, but onely that it seem'd to us to incline much more to a greenish colour, then the blower flame of Brimstone is wont to do.

To these *Phænomena* of our Experiment, as it was made with Copper, my Notes inable me to subjoyn some others, exhibited when we made it with Sublimate and Silver.

There were taken of the purest sort of Coined Silver we could get, half a score thin Plates, on which vvas cast double the vveight of Sublimate in a small and strongly coated Retort. This Matter being sublim'd in a naked fire, vve found, (having broken the Vessel,) that the Sublimate vvas almost totally ascended to the top and neck of the Retort, in the latter of vvhich appear'd in
many

many places some reviv'd Mercury, in the bottom of the Retort we found a little fluxed Lump of Matter, which 'twas scarce possible to separate from the Glass, but having, with much adoe divorc'd them, we found this Mass to be brittle, of a pale yellowish colour, of neer about the weight of the Metal, on which the Sublimate had been cast. And in the thicker part of this Lump there appear'd, when it was broken, some part of the Silver plates, vvhich, though brittle, seem'd not to have been perfectly dissolv'd. This Refin of Silver did, like that of Copper, but more slowly, imbibe the Moisture of the Air, and vvithin about 24 hours, vvas cover'd vvith a somevvhat greenish Dust, concerning vvvhich vve durst not determine, vvwhether it proceeded from that mixture of Copper, vvvhich is generally to be met vvith in coyned Silver, or from the compounded Metal. For the more curious sort of Painters do, as they in-

form us, by corroding coined Silver
 vvith the fretting steams of saline Bo-
 dies, or vvith corrosive Bodies them-
 selves, turn it into a fine kind of Azure,
 as we may elsevvhere have opportunity
 more particularly to declare. I shall
 novv onely adde, that some small frag-
 ments of our Resin, being cast upon red
 hot Coals, did there vvast themselves
 in a flame not very differing in colour
 from that of the former mention'd Re-
 sin of Copper, but much more durable
 then vvould have easly been expected
 from so small a quantity of Matter.

This is all the Account I can give you
 of our first Tryal, but suspecting, that
 the Copper, vvont to be mixt as an
 Alloy vvith our coyned Silver, might
 have too much Influence on the recited
 Event; coming attervvards into a place,
 vvhere vve could procure Refin'd Sil-
 ver, vve took an Ounce of That, and
 having Laminated it, vve cast it upon
 tvvice its Weight of beaten Sublimate,
 vvhich

which being driven away from it with a somewhat strong fire, we took, out of the bottom of the Glafs Retort, a Lump of Matter, which in some places, where it lay next the Glasse, was as it were silver'd over very finely, but so very thinly, that the Thicknesse of the Silver scarce equall'd that of fine white Paper; the rest of the Metal (except a little that lay undissolv'd almost in the middle of the Masse, because, as we suppos'd, the Plates had not been beaten, till they were sufficiently and equally thin,) having been, by the saline part of the Sublimate, that stuck to it, colliquated into a Mass, that look'd not at all like Silver, or so much as any other Metal or Mineral.

And tis remarkable, that though Silver be a fixt Metal, and accounted indestructible, yet it should by so slight an Operation, and by but about a quarter of its vveight of Additament, (as appear'd by weighing the whole Lump,)

be so strangely disguised, and have its Qualities so alter'd.

For (first) though an eminent Whitenesse be accounted the colour, which belongs to pure Silver, and though beaten Sublimate be also eminently White; yet the Mass, we are speaking of, was partly of a Lemmon or Amber colour, or a deep Amethyftinine colour, and partly of so dark a one, as it seem'd black: and it was pretty, that sometimes in a fragment, that seem'd to be one continued and entire piece, the upper part would be of a light Yellow, vvhich abruptly ending, the lower vvas of a colour so obscure, as scarce to challenge any name distinct from Black.

Next whereas Silver is one of the most Opacous Bodies in Nature, and Sublimate a White one, the produc'd Mass was in great part Transparent, though not like Glass, yet like good Amber.

Thirdly, the Texture of the Silver
vvas

was exceedingly alter'd: for our Mass; instead of being Malleable and Flexible, as that Metal is very much, appear'd, if you went about to cut it with a Knife, like Horn, yet otherwise easily apt to crack and break, though not at all to bend.

Fourthly, whereas Silver will indure Ignition for a good while before it be brought to Fusion, our Mixture will easily melt, not onely upon quick coals, but in the flame of a Candle; but this Resin, or Gum (if I may so call it) of our fix'd Metal did not, like that, we formerly describ'd, of Copper, tinge the flame of a Candle, or produce with the glowing coals, on which tis laid, either a green or blewish colour.

And (*Pyrophilus*) to discover how much these Operations of the Sublimate upon Copper and Silver depend upon the particular Textures of these Bodies, I took two parcels of Gold, the one common Gold thinly laminated,

and the other very well refin'd, and having cast each of these in a distinct Urinal, upon no less then thrice its weight of grossly beaten Sublimate, I caus'd this last nam'd substance to be, in a Sand furnace, elevated from the Gold, but found not, that either of the two Parcels of that Metal was manifestly alter'd thereby: whether in case the Gold had been reduc'd to very minute particles, some kind of change (perhaps, if any differing enough from those lately recited to have been made in the Copper and the Silver) might have been made in it, I am not so absolutely certain; but I am confident, that by what I reserve to tell you hereafter of Sublimates Operation upon some other Minerals, especially Tin, it will appear, that That Operation depends very much upon the particular Texture of the Body, from whence that sublimate is Elevated.

Before I dismiss this subject, *Pyrophilus*, I must not conceale from you, that

in

in the Papers, whence these Experiments made with Sublimate have been transcribed, I annex'd to the whole Discourse a few Advertisements, whereof the first was, That I was reduc'd, in those Experiments, to imploy, for want of a better, a Sand Furnace, wherein I could not give so strong a fire as I desir'd, which circumstance may have had some Influence upon the recited *Phænomena*; and among other Advertisements there being one, that will not be impertinent to my present Design, and may possibly afford a not unsuccessful Hint, I shall subjoin it in the words, wherein I find it deliver'd.

The next thing, of which I am to advertise you, is this, That this Experiment may probably be further improv'd, by imploying about it various and new kinds of Sublimate, and that several other things may be sublim'd up together either with crude Mercury, or with common Sublimate, he that considers

siders the way of making vulgar Subli-
 mate, will not, I suppose, deny. To give
 you onely one Instance, I shall inform
 you, that, having caus'd about equal parts
 of common Sublimate and Sal Armoni-
 ack to be well powder'd and incorpora-
 ted, by subliming the Mixture in strong
 and large Urinals plac'd in a Sand
 Furnace, we obtain'd a new kind of Sub-
 limate, differing from the former, which
 we manifested *ad Oculum*, by dissolving
 a little of it and a little of common Sub-
 limate severally in fair water; for drop-
 ping a little resolv'd salt of Tartar upon
 the solution of common Sublimate, it
 immediately turn'd of an Orange tawny
 colour, but dropping the same Liquor
 upon the solution of the Ammoniack
 Sublimate, if I may so call it, it present-
 ly turn'd into a Liquor in Whitenesse
 resembling Milk: And having from 4
 ounces of Copper plates drawn 6 ounces
 of this new Sublimate after the already
 often recited manner, we had indeed in
 the

the bottom of the Retort a Cupreous Resin, not much unlike That, made by Copper and common Sublimate; and this Resin did, like the other, in the moist Air, soon begin to degenerate into a kind of Verdigreese. But that which was singular in this Operation was, that not onely some of the Sublimate had carried up, to a good height, enough of the Copper to be manifestly colour'd by it of a fine blewish Green, but into the Receiver there was pass'd neer an Ounce of Liquor, that smelt almost like Spirit of Sal Armoniack, and was tinged like the Sublimate, so that we suppos'd the Body of the Venus to have been better wrought upon by this, then by the former Sublimate. And yet I judg'd not this way to be the most effectual way of improving common Sublimate, being apt to think, upon grounds not now to be mention'd, that it may, by convenient Liquors, be so far enrich'd and advanc'd, as to be made capable of
opening

opening the Compact Body of Gold it self, and of producing in it such Changes, (which yet perhaps will enrich but mens Understandings,) as Chymists are wont very fruitlessly to attempt to make in that almost Indestructible Metal. But of This, having now given you a Hint, I dare here say no more.

Experiment III.

THere is (*Pyrophilus*) another Experiment, which many will find more easie to be put in practice, and which yet may, as to Silver, be made a kind of *succedaneum* to the former, and consequently may serve to shew, how the like Qualities in Bodies may be effected by differing Wayes, provided a like Change of Texture be produc'd by them. Of This I shall give you an Example in that Preparation of Silver, that some Chymists have call'd *Luna Cornea*, which I shall not scruple to men.

mention particularly, and apply to my present purpose; because though the name of *Luna Cornea* be already to be met with in the Writings of some Alchymists, yet the thing it self, being not us'd in Physick, is not wont to be known by those that learn Chymistry in order to Physick; and the way that I use in making it is differing from that of Alchymists, being purposely design'd to shew some notable *Phanomena*, not to be met with in their way of proceeding.

We take then refined Silver, and having beaten it into thin Plates, and dissolv'd it in about twice its Weight of good *Aqua fortis*, we Filtrate it carefully to obtain a clear Solution, (which sometimes we Evaporate further, till it shoot into Chrystals, which we afterwards dry upon brown Paper with a moderate heat.)

Upon the abovemention'd solution we drop good spirit of Salt, till we find, that it will no more curdle the Liquor
it

It falls into, (which will not happen so soon, as you will be apt at first to imagine,) then we put the whole Mixture in a Glass Funnel lin'd with Cap-paper, and letting the moisture drain through, we dry, with a gentle heat, the substance, that remains in the Filtre, first washing it (if need be) from the loosely adhæring Salts, by letting fair Water run through it several times, whilst it yet continues in the Filtre. This substance being well dry'd, we put it into a Glass Viol, which being put upon quick coals, first cover'd with Ashes, and then freed from them, we melt the contain'd substance into a Mass, which, being kept a while in Fusion, gives us the *Luna Cornea* we are now to consider.

If to make this Factitious Concrete, we first reduce the Silver into Chrystals, and afterwards proceed with spirit of Salt, as we have just now taught you to do with the solution, we have the exceedingly Opacous, Malleable, and hard-
ly

ly Fusible Body of Silver, by the convenient interposition of some saline Particles, not amounting to the third part of the Weight of the Metal, reduc'd into Chrystals, that both shoot in a peculiar and determinate figure, differing from those of other Metals, and also are diaphanous and brittle, and by great odds more easily fusible then Silver it self; besides other Qualities, wherein having elsewhere taken notice, that these Chrystals differ both from Silver and from *Aqua fortis*, we shall not now insist on them, but pass to the Qualities, that do more properly belong to the change of the Solution of Silver into *Luna Cornea*.

First then we may observe, that though Spirit of Salt be an highly acid Liquor, and though acid Liquors and *Alkalys* are wont to have quite contrary Operations, the one præcipitating what the other would dissolve, & dissolving what the other would præcipitate: yet in our case,

case, as neither Oyl of Tartar *per deliquium*, nor spirit of Salt will dissolve Silver, so both the one and the other will præcipitate it; which I desire may be taken notice of against the Doctrine of the Vulgar Chymists, and as a Proof, that the Præcipitation of Bodies depends not upon acid or Alkalizate Liquors as such, but upon the Texture of the Bodies, that happen to be confounded.

2. We may here observe, that Whiteness and Opacity may be immediately produc'd by Liquors, both of them Diaphanous and colourless.

3. That on the other side, a White Powder, though its minute parts appear not transparent, like those of beaten Glass, Rosin, &c. which, by comminution, are made to seem White, may yet, by a gentle heat, be presently reduc'd into a Mass indifferently Transparent, and not at all White, but of a fair Yellow.

4. We

4. We may observe too, that though Silver require so strong a fire to melt it, and may be long kept red hot, without being brought to Fusion; yet by the association of some saline particles, conveniently mingled with it, it may be made so fusible, as to be easily and quickly melted, either in a thin Viol, or at the flame of a Candle, where it will flow almost like Wax.

5. It may also be noted, that though the Lunar solution and the spirit of Salt would, either of them apart, have readily dissolv'd in Water; yet when they are mingled, they do, for the most part, concoagulate into a substance, that will lie undissolv'd in Water, and is scarce, if at all, soluble either in *Aqua fortis*, or in spirit of Salt.

6. And remarkable it is, that the Body of Silver being very flexible and malleable, (especially if the Metal be, as ours was, refin'd) it should yet, by the Addition of so small a proportion of
Y salt,

Salt, (a Body rigid and brittle,) as is associated to it in our Experiment, be made of a Texture so differing from what either of its Ingredients was before, being wholly unlike either a Salt or a Metal, and very like in Texture to a piece of Horn. And to satisfy myself, how much the Toughness of this Metalline Horn depended upon the Texture of the *Compositum*, resulting from the respective Textures of the several Ingredients, I præcipitated a solution of Silver with the distill'd saline Liquor commonly call'd Oyl of Vitriol, instead of spirit of salt, and having wash'd the Præcipitate with common Water, I found agreeably to my conjecture, that this Præcipitate, being flux'd in a moderate heat, afforded a Mass, that look'd like enough to the Concrete we have been discoursing of, but had not its Toughness, being brittle enough to be easily broken in pieces. But the two considerablest *Phænomena* of our Experiment

Experiment do yet remain unmentiond.

For 7^{thly}. Tis odd, that whereas a solution of Silver is, as we have often occasion to note, the bitterest Liquor we have ever met with, and the spirit of Salt far sower then either the sharpest Vinegar, or even the spirit of it, these two so strongly and offensively tasted Liquors should be so easily and speedily, without any other thing to correct them, be reduc'd into an insipid substance, (at least so far insipid, that I have lick'd it several times with my Tongue, without finding it otherwise, though perhaps, with much rowling it to and fro in the mouth, it may at length afford some unpleasant Taste, but exceedingly different from that of either of the Liquors that compos'd it:) and This, though the Salts, that made both the Silver, and the præcipitating spirit so strongly tasted, remaine associated with the Silver.

8. And Lastly, it is very strange,
Y 2 that

that though the saline Corpuscles, that give the efficacy both to good *Aqua fortis*, and the like spirit of Salt, be not onely so volatile, that they will easily be distill'd with a moderate fire, but so fugitive, that they will in part fly away of themselves in the cold Air, (as our Noses can witness to our trouble, when the Viols, that contain such Liquors, are unstopt;) yet by vertue of the new Texture they acquire, by associating themselves with the Corpuscles of the Silver and with one another, these minute particles of salt loose so much of their former Lightness, and acquire such a degree of Fixednesse, that they will endure melting with the Metal they adhere to, rather then suffer themselves to be driven away from it. Nor do I remember, that when I melted this Mass in a thin Viol, I could perceive any sensible Evaporation of the Matter: nay having afterwards put a parcel of it upon a quick Coal, though that were blown

to intend the heat; yet it suffer'd Fusion, and so ran off from the Coal, without appearing, when it was taken up again, to be other then *Luna Cornea*, as it was before.

Experiment IV.

I Am now (*Pyrophilus*) about to do a Thing, contrary enough both to my Custome and Inclination, that is, To discourse upon the *Phanomena* of an Experiment, which I do not teach you to make. But since I cannot as yet, without some breach of promise, plainly disclose to you what I must now conceal, your Equity assures me of your Pardon. And as, because the Qualities of the Salt, I am to speak of, are very remarkable, and pertinent to my present design, I am unwilling to pass them by unmention'd; so I hope, that notwithstanding their being strange, I may be allow'd to discourse upon them to you,

who, I presume, know me too well to suspect I would impose upon you in matters of fact, and to whom I am willing (if you desire it) to shew the Anomalous Salt it self, and Ocular proofs of the chief properties I ascribe to it.

I shall not then scruple to tell you, that Discoursing one day with a very Ingenious Traveller and Chymist, who had had extraordinary Opportunities to acquire Secrets, of a certain odd Salt I had thought upon and made, which was of so differing a kind from other Salts, that though I did not yet know what Feats I should be able to do with it, yet I was confident, it must have Noble and unusual Operations. This Gentleman, to requite my Franckness, told me, that I had lighted on a greater Jewel, then perhaps I was aware of; and that if I would follow his Advice, by adding something that he nam'd to me, and prosecuting the Preparation a little further, I should obtain a Salt exceedingly

ly

ly noble. I thank'd him, as I had cause, for his Advice, and, when I had Opportunity, follow'd it. And though I found the vway of making this Salt so nice and intricate a thing, that if I vvould, I could scarce easily describe it, so as to enable most men to practice it; yet having once made it, I found, that, besides some of the things I had been told it would perform, I could do divers other things vvith it, vvhich I had good cause to believe the Gentleman, of whom I was speaking, did not think of; and I doubt not, but I should have done much more with it, if I had not unfortunately lost it soon after I had prepar'd it.

Several of the *Phænomena*, I try'd to produce with it, which are not so proper for this place, are reserv'd for another, but here I shall mention a few, that best fit my present purpose.

First then, though the several Ingredients, that compos'd this Salt, were all of them such, as Vulgar Chymists must

according to their Principles, look upon as purely Saline, and were each of them far more salt then Brine, or more sower then the strongest Vinegar, or more strongly tasted then either of those two Liquors; yet the Compound, made up of onely such Bodies, is so far from being eminently salt, or sower, or insipid, that a Stranger being ask'd, what Tast it had, vvould not scruple to judge it rather sweet, then of any other Tast: though its Sweetness be of a peculiar kind, as there is a difference even among Bodies sweet by Nature, the sweetness of Sugar being divers from that of Honey, and both of them differing from that of the sweet Vitriol of Lead. And this is the onely instance, I remember, I have hitherto met vvith of Salts, that, vvithout the mixture of insipid Bodies, compose a substance *really sweet*. I say *really sweet*, because Chymists oftentimes terme the *Calces* of Metals and other Bodies *dulcifi'd*, if they be freed from

from all corrosive salts and sharpness of
Tast, *sweet*, though they have nothing
at all of positive sweetness in them; and
by that licence of speaking do often e-
nough impose upon the Unskilful.

Another thing considerable in our A-
nomalous Salt is, That though its O-
dour be not either strong or offensive,
(both which that of Volatile Salts is
wont to be,) yet if it be a little urg'd
with heat, so as to be forc'd to evapo-
rate hastily and copiously, I have known
some, that have been us'd to the power-
ful stink of *Aqua fortis*, distill'd Urine,
and even spirit of Sal Armoniack its
self, that have complain'd of this smell,
as more strong, and upon that account
more unupportable then these them-
selves: and yet when these Fumes settle
again into a Salt, their Odour will again
prove mild and inoffensive, if not plea-
sant.

Thirdly, whereas all the Volatile, and
Acid, and Lixivate Salts, that we know
of,

of, are of so determinate and specified a Nature, (if I may so speak,) that there is no one sort of the three, but may be destroy'd by some one or other of the other two Salts, if not by both, as spirit of Urine, which is a volatile Salt, being mingled with spirit of Salt, or *Aqua fortis*, or almost any other strong and acid spirit, will make a great Ebullition, and loose its peculiar Taste, and several of its other Qualities; and on the other side, Salt of Tartar, and other *Alkalys*, (that is, Salts produc'd by Incineration of mix'd Bodies,) will be destroy'd with Ebullition by *Aqua fortis*, spirit of Salt, or almost any other strong spirit of that Family. And spirit of Salt, *Aqua fortis*, &c. will be (as they speak) destroy'd both by Animal volatile Salts, and by the fix'd Salts of Vegetables; that is, will make an Effervescence with either sort of Salts, and compose with them a new Liquor or Salt, differing from either of the ingredients, and, as to taste, smell, odour,

odour, and divers other Qualities, more languid and degenerous: whereas, I say, each of these three Families of Salts may be easily destroy'd by the other two, our Anomalous Salt seems to be above the being *thus wrought* upon by any of all the three, and is the onely Body I know: (which is no small priviledge, or rather prerogative,) for I did not find, that a Solution of it, made with as little Water as I could, which is the vvay whereby we usually make it fluid, would make any Ebullition, either with Oyl of Tartar *per Deliquium*, or spirit of Sal Armoniack, or strong spirit of Salt, or even Oyl of Vitriol, but would calmely and silently mix vvith these differing Liquors, and continue as long as I had patience to look upon them, without being præcipitated by them. But this is not the onely way I imploy'd to examine, whether our Salt belong'd to any of the three above mention'd comprehensive families of Salts. For

I

I found not, that the strongest solution of it would turn Syrup of Violets either red, as acid spirits do, or green, as both fix'd and volatile Salts will do. Nor would our Solution turn a clear one of Sublimate made in common Water, either white, as spirit of Urine, Sal Armoniack, or others of the same family, or into an Orange Tawny, like salt of Tartar, and other *Alkalys*: but left the solution of Sublimate transparent, without giving it any of these colours, mingling it self very kindly with it, as it had done with the four lately mention'd Liquors. And to satisfy my self a little further, I not onely try'd, that an undiscolour'd mixture of syrup of Violets and our solution, would immediately be turn'd red by 2 or 3 drops of spirit of Salt, or green by as much Oyl of Tartar: but, to prosecute the Experiment, I let fall a drop or two of a mixture made of our Anomalous solution, and spirit of Salt well shaken together, upon
some

some syrup of Violets, which was thereby immediately turn'd red, and a little of the same Anomalous solution, being shaken together with Oyl of Tartar *per Deliquium*, turn'd another parcel of the same syrup of Violets into a delightful green; which, hapning as I expected, seem'd to argue, that our Solution, though as to sense it were exquisitely mingled in the several mixtures, to which I had put it, did, as it left them their undestroy'd respective Natures, retain its own; and yet this Salt is so far from being a languid or an insignificant thing, that *Aqua fortis*, and Oyl of Vitriol themselves, as operative and as furious Liquors as they are, are unable in divers cases to make such Solutions, and perform such other things, as our calme, but powerful, Menstruum can, though but slowly, effect.

Fourthly: Though this Salt be a volatile one, and requires no strong heat to make it sublime into finely figur'd
Chry-

Chrystals without a remanence at the Bottom; yet being dissolv'd in Liquors, you may make the Solution, if need be, to boile, without making any of the Salt sublime up, before the Liquor be totally or almost totally drawn off, whereas the volatile salt of Urine, Bloud, Harts-horn, &c. are wont to ascend before almost any part of the Liquor, they are dissolv'd in, which is in many cases very inconvenient.

And though this be a Volatile salt, yet I remember not, that I have observ'd any fix'd salt, (without excepting salt of Tartar it self,) that runs near so soon *per Deliquium*, as this will do; but by abstraction of the adventitious moisture tis easily restor'd to its former saline form: and yet differs from salt of Tartar, not onely in Fixednesse and Taste, and divers other qualities, but also in this, That, whereas salt of Tartar requires a vehement fire to flux it, a gentlier heat, then one would easily imagine,

gine, will melt our Salt into a Limpid Liquor.

And whereas spirit of Wine will dissolve some Bodies, as Sanderick, Mastick, Gum-Lac, &c. and Water, on the other side, dissolves many that spirit of Wine cannot, and Oyls will dissolve some, for which neither of the other Liquors are good solvents; our salt will readily dissolve both in fair Water, in the highest rectifi'd spirit of Wine, (and That so little, as not to weigh more then the salt,) and in Chymical Oyls themselves, with which it will associate its self very strictly, and perhaps more too, then I have yet found any other consistent salt to do.

Experiment V.

THe Experiment I am (*Pyrophilus*) now about to deliver, though I have not yet had Opportunity to perfect what I design'd, when some Notions

ons, that I have about Fire and Salt, suggested it to me, is yet such as may far more clearly, then almost any of the Experiments commonly known to Chymists, serve to shew us, how near to a real Transmutation those Changes may prove, that may be effected even in inanimate, and, which is more, scarce corruptible Bodies, by the recess of some Particles, and the access of some others, and the new Texture of the residue. The Experiment I have made several wayes, but one of the latest and best I have us'd is this: Take one part of good Sea-salt well dry'd and powder'd, and put to it double its weight of good *Aqua fortis*, or spirit of Nitre, then having kept it (if you have time) for some while in a previous digestion, distill it over with a slow fire in a Retort or a low Body, till the the remaining Matter be quite dry, and no more; for this substance, that will remain in the bottom of the Glass, is the thing that is sought for.

This

This Operation being performable in a moderate fire, and the Bodies themselves being almost of an incorruptible nature, one would scarce think, that so slight a matter should produce any Change in them; but yet I found, as I expected, these notable Mutations of Qualities effected by so unpromising a way.

For in the first place, we may take notice, that the Liquor, that came over, was no longer an *Aqua fortis*, or Spirit of Nitre, but an *Aqua Regis*, that was able to dissolve Gold, which *Aqua fortis* will not meddle with, and will not dissolve Silver, as it would have done before, but will rather, as I have purposefully try'd, præcipitate it out of *Aqua fortis*, if that Menstruum have already dissolved it: but this Change belonging not so properly to the substance it self I was about to consider, I shall not here insist on it.

2. Then, the Taste of this Substance

Z

comes

comes by this Operation to be very much alter'd. For it hath not that strong saltness that it had before, but tastes far milder, and, though it relishes of both, affects the Palate much more like Salt-petre, then like common salt.

3. Next, whereas this last nam'd Body is of very difficult Fusion, our factitious salt imitates salt-petre in being very fusible, and it will, like Nitre, soon melt, by being held in the flame of a Candle.

4- But to proceed to a more considerable *Phanomenon*, tis known, that Sea-salt is a Body, that doth very much resist the fire, when once by being brought to Fusion, it hath been forc'd to let go that windy substance, that makes unbeaten salt crackle in the fire, and so by blowing it accidentally increase it. Tis also known, that acid spirits, as those of Salt, Vitriol, Nitre, Vinegar, &c. are not onely not inflammable themselves, but hinderers of inflammation

mation in other Bodies; and yet my Conjecture leading me to expect, that, by this Operation, I should be able to produce, out of two inflammable Bodies, a third, that would be easily inflammable. I found, upon Tryal, not only that small Lumps of this substance, cast upon quick and well blown coals, though they did not give so blew a flame as Nitre, did yet, like it, burn away with a copious and vehement flame. And, for further Tryal, having melted a pretty quantity of this transmuted Sea salt in a Crucible, by casting upon it little fragments of well kindled Charcoal, it would, like Nitre, presently be kindled, and afford a flame so vehement and so dazling, that one that had better Eyes than I, and knew not what it was, complain'd, that he was not able to support the splendor of it. Nor were all its inflammable parts consum'd at one deflagration: for by casting in more fragments of well kindled Coal, the Matter

would fall a puffing, and flame afresh for several times consecutively, according to the quantity that had been put into the Crucible.

5. But this it self was not the chief discovery I design'd by this Experiment. For I pretended hereby to devise a way of turning an acid salt into an *Alkaly*, which seems to be one of the greatest and difficultest Changes, that is rationally to be attempted among durable and inanimate Bodies. For tis not unknown to such Chymists as are any thing inquisitive and heedful, how vast a difference there is between acid Salts, and those, that are made by the combustion of Bodies, and are sometimes call'd Fix'd, sometimes Alkalizate. For whereas strong Lixiviums (which are but strong solutions of *Alkalys*) will readily enough dissolve common Sulphur, and divers other Bodies abounding with Sulphur; even those highly acid Liquors, *Aqua fortis*, and *Aqua Regis*,

Regis, though so corrosive, that one will dissolve Silver, and the other Gold it self, will let Brimstone lye in them undissolv'd I know not how long; though some say, that in process of time, there may be some Tincture drawn by the Menstruum from it, which yet I have not seen try'd; and though it were true, would yet sufficiently argue a great disparity betwixt those acid spirits, and strong Alkalizate solutions, which will speedily dissolve the very masse of common Sulphur. Besides, tis observ'd by the inquisitive Chymists, nor does my Experience contradict it, that the Bodies, that are dissolv'd by an acid Menstruum, may be præcipitated by an Alkalizate; and on the contrary, solutions, made by the latter, may be præcipitated by the former. Moreover, as Litharge, dissolv'd in spirit of Vinegar, will be præcipitated by the Oyl of Tartar *per Deliquium*, or the solution of its Salt; and, on the contrary, Sulphur or

Antimony, dissolv'd in such a solution, will be præcipitated out of it by the spirit of Vinegar, or even common Vinegar. Moreover, Acids and Alkalizates do also differ exceedingly in tast, and in this greater disparity, that the one is volatile, and the other fix'd, besides other particulars not necessary here to be insisted on. And indeed, if that were true, which is taught in the Schools, that there is a natural enmity, as well as disparity betwixt some Bodies, as between Oyl and waterish ones, the Chymists may very speciously teach, (as some of them do) That there is a strange contrariety betwixt Acid and Alkalizate Salts, as when there is made an Affusion of oyl of Tartar upon *Aqua Regis*, or *Aqua fortis*, to præcipitate Gold out of the one, and Silver out of the other, their mutual Hostility seems manifestly to shew it self, not onely by the noise, and heat, and fume, that are immediately excited by their conflict,

conflict, but by this most of all, that afterwards the two contending Bodies will appear to have mutually destroy'd one another, both the sour Spirit and the fixt Salt having each lost its former Nature in the scuffle, and degenerated with its Adversary into a certain Third substance, that wants several of the Properties both of the sour Spirit and the *Alkaly*. Now to apply all this to the Occasion, on which I mention'd it, how distant and contrary soever the more inquisitive of the latter Chymists take *Acid* and *Fixed* Salts to be; yet I scarce doubted, but that, by our Experiment, I should, from acid salts, obtain an *Alkaly*, and accordingly having, by casting in several bits of well kindled coal, excited, in the melted Mass of our transmuted Salt, as many Deflagrations as I could, and then giving it a pretty strong fire to drive away the rest of the more fugitive parts, I judg'd, that the remaining Masse would be (like the fix'd

Nitre I have elsewhere mention'd) of an Alkalizate nature, and accordingly having taken it out, I found it to tast, not like Sea-salt, but fiery enough upon the Tongue, and to have a Lixivate relish. I found too, that it would turn Syrup of Violets into a greenish colour, that it would præcipitate a Limpid solution of Sublimate, made in fair water, into an Orange tawny Powder. I found, that it would, like other fix'd salts, produce an Ebullition with acid spirits, and even with spirit of salt it self, and coagulate with them. Nor are these themselves all the ways I took to manifest the Alkalizate Nature of our transmuted Sea-salt.

I did indeed consider at first, that it might be suspected, that this new Alkalizatenesse might proceed from the Ashes of the injected Coals, the Ashes of Vegetables generally containing in them more or lesse of a fix'd Salt. But when I consider'd too, that a pound of Char-

Charcoal, burn'd to Ashes, is wont to yield so very little Salt, that the injected fragments of Coal, (though they had been, which they were not) quite burn'd out in this Operation, would scarce have afforded two or three grains of salt, (perhaps not half so much,) I saw no reason at all to believe, that in the whole Mass I had obtain'd (and which was all, that was left me of the Sea-salt, I had at first imploy'd,) it was nothing but so inconsiderable a proportion of Ashes, that exhibited all the *Phænomena* of an *Alkaly*.

And for further confirmation both of This, and what I said a little before, I shall adde, that to satisfy my self yet more, I pour'd, upon a pretty quantity of this Lixivate salt, a due proportion of *Aqua fortis*, till the hissing and ebullition ceased, and then leaving the fluid Mixture for a good while to coagulate, (which it did very slowly,) I found it at length to shoot into saline Crystals,

stals, which though they were not of the figure of Nitre, did yet, by their inflammability and their bigness, sufficiently argue, that there had been a Conjunction made betwixt the Nitrous Spirit, and a considerable proportion of *Alkaly*.

I consider'd also, that it might be suspected, that in our Experiment twas the Nitrous Corpuscles of the *Aqua fortis*, that, lodging themselves in the little rooms deserted by the saline Corpuscles of the Sea-salt, that pass'd over into the Receiver, had afforded this *Alkaly*; as common Salt-petre, being handled after such a manner, would leave in the Crucible a fix'd or *Alkalizate* Salt. But to this I answer, that as the Sea-salt, which was not driven over by so mild a Distillation, and seem'd much a greater part then that which had pass'd over, was far from being of an *Alkalizate* nature: so the Nitrous Corpuscles, that are presum'd to have stay'd behind, were
whilst

whilst they compos'd the spirit of Nitre, of an highly volatile and acid Nature, and consequently of a nature directly opposite to that of *Alkalis*; and if by the addition of any other substance, that were no more *Alkalizate* then Sea-salt, an *Alkaly* could be obtain'd out of spirit of Nitre or *Aqua fortis*, the Produci-
 bleness of an *Alkaly* out of Bodies of another nature might be rightly thence inferr'd: so that however, it appears, that by the intervention of our Experiment, two Substances, that were formerly acid, are turn'd into one, that is manifestly of an *Alkalizate* Nature, which is That we would here evince.

Perhaps it may (*Pyrophilus*) be worth while to subjoin; That to prosecute the Experiment by inverting it, we drew two parts of strong spirit of Salt from one of purifi'd Nitre; but did not observe the remaining Body to be any thing neer so considerably chang'd as the Sea-salt, from which we had drawn
 the

the Spirit of Nitre; since though the Spirit of Salt, that came over, did (as we expected) bring over so many of the Corpuscles of the Nitre, that, being heated, it would readily enough dissolve foliated Gold; yet the Salt, that remain'd in the Retort, being put upon quick Coals, did flash away with a vehement and halituous flame, very like that of common Nitre.

Experiment VI.

I Come now (*Pyrophilus*) to an Experiment, which, though in some things it be of kin to that which I have already taught you, concerning the changing of Sea-salt by *Aqua fortis*, will yet afford us divers other instances, to shew, how upon the change of Texture in Bodies, there may arise divers new Qualities; especially of that sort, which, because they are chiefly produc'd by Chymistry, and are wont to be consider'd

der'd by Chymists, if not by Them only, may in some sense be call'd Chymical.

The Body, which, partly whilst we were preparing it, and partly when we had prepar'd it, afforded us these various *Phænomena*, either is the same that *Glauberus* means by his *Sal Mtrabilis*, or at least seems to be very like it: and whether it be the same or no, its various and uncommon Properties make it very fit to have a place allow'd it in this Treatise. Though of the many Tryals I made with it, I can at present find no more among my loose Papers, then that following part of it, that I wrot some years ago to an Ingenious Friend, who I know will not be displeas'd, if, to save my self some time, and the trouble of Examining my Memory, I annex the following Transcript of it.

[To give you a more particular account of what I writ to you from *Oxford* of my Tryals about *Glauber's Salt*,
though

though I dare not say, that I have made the self same Thing, which he calls his *Sal Mirabilis*, because he has describ'd it so darkly and ambiguously, that tis not easie to know with any certainty what he means; yet whether or no I have not made Salt, that, as far as I have yet try'd it, agrees well enough with what he delivers of His, and therefore is like to prove either his *Sal mirabilis*, or almost as good a one, I shall leave you to judge by this short Narrative.

The strange things that the Industrious *Glauber's* Writings have invited Men to expect from his *Sal mirabilis*, in case he be indeed possess'd of such a thing, and the Enquiries of divers Eminent Men, who would fain learn of me, what I thought of its Reality and Nature, invited me, the next Opportunity I got, to take into my hands his *Pars altera Miraculi Mundi*, whose Title you know promises a Description of this *Sal Artis intrificum*, as he is pleas'd to call it. But,

I confefs, I did not read it near all over, because a great part of it is but a Transcription of several entire Chapters out of *Paracelsus*, and I perceiv'd, that much of the rest did, according to the custome or Chymical Writings, more concern the Author, then the subject; wherefore looking upon his process of making his *sal mirabilis*, I soon perceiv'd he had no mind to make it common, since he onely bids us upon two parts of common Salt dissolv'd in common Water, to pour *A*, without telling us what that *A* is, wherefore reading on in the same process, and finding that he tels us, that with *B* (which he likewise explaines not at all, nor determines the quantity of it) one may make an *Aqua fortis*, it presently call'd into my mind, That some Years before, having had Occasion to make many Tryals, mention'd in other Tracts of mine, with Oyl of Vitriol and Salt petre, I did, among other things, make a red spirit of Nitre, by the help
one-

onely of Oyl of Vitriol; remembring This(I say) I resorted to one of my *Carneades's* Dialogues,*and reviewing that Experiment, as I have set it down, I concluded, That though I had not dissolv'd the Salt petre in Water, as *Glauber* doth his common Salt; yet since, on the other side, I made use of external fire, 'twas probable I might this way also get a Nitrous spirit, though not so strong. And though by calling the Liquor, that must make an *Aqua fortis B*, whereas he had call'd that, which is to make his spirit of Salt and *sal mirabilis*, *A*, he seem'd plainly to make them differing things, yet relying on the Experiment I had made, and putting to a solution of Nitre as much of the Oyl of Vitriol as I had taken last, though That be double the quantity he prescribes for the making of his *Sal mirabilis*, I obtain'd, out of a low glassie Body and Head plac'd in Sand, an indit-

* See the Sceptical Chymist.

ferent good *Spiritus Nitri*, that even before Rectification would readily enough dissolve Silver, though it were diluted with as much of the common Water, wherein Salt-petre had been dissolv'd, as amounted at least to double or treble the weight of the Nitrous parts; the remaining Matter, being kept in the fire till it was dry, afforded us a Salt easily reducible (by Solution in fair Water and Coagulation) into Crystalline Grains, of a nature very differing both from crude Nitre, and from fixt Nitre, and from Oyl of Vitriol. For it coagulated into pretty big and well shap'd Grains, which, you know, fix'd Nitre and other *Alkalizate* Salts are not wont to do; and these Graines were not like the Chrystals of Salt-petre it self, long and Hexaedrical, but of another figure, not easie nor necessary to be here described.

Besides, this Vitriolate Nitre (if I may so call it) would not easily, if at all,

A a

flow,

flow in the Air, as fixt Nitre is vvont to do. Moreover, it was easly enough fusible by heat, vvhereas fix'd Nitre doth usually exact a vehement Fire for its Fusion; and though crude Salt-petre also melts easly, yet to satisfie you how differing a substance this of ours was from That, vve cast quick Coals into the Crucible, without being at all able to kindle it. Nay, and vvhen, for further Tryal, vve threw in some Sulphur also, though it did flame away it self, yet did it not seem to kindle the Salt, that was hot enough to kindle It; much less did it flash, as Sulphur is wont on such occasions to make Salt-petre do. Add to all this, That a parcel of this white substance, being, vvithout Brimstone, made to flow for a vvhile in a Crucible, with a bit of Charcoal for it to vvork upon, grew manifestly and strongly sented of Sulphur, and acquir'd an *Alkalizate* Tast, so that it seem'd almost a Coal of fire upon the Tongue,
it

if it were lick'd before it imbib'd any of the Aires moisture, and (which many perhaps will, though I do not, think stranger) obtain'd also a very red colour; which recall'd to my mind, that *Glauber* mentions such a Change observable in his Salt, made of common Salt, upon whose Account he is pleas'd to call such a substance his *Carbunculus*.

Being invited by this success to try, whether I could make his *Sal mirabilis*; notwithstanding his intimating, as I lately told you, that it is done with a differing Menstruum from that, where-with the Salt-petre is to be wrought upon; I observ'd, that where he points at a way of making his Salt in quantity without breaking the Vessels, he prescribes, that the Materials be distill'd in Vessels of pure Silver; whence I conjectur'd, that 'twas not *Aqua fortis*, or spirit of Nitre, that he imploy'd to open his Sea-salt: and that consequently, since common spirit of Salt was too

A a a

vweak

weak to effect so great a Change, as the Experiment requires, 'twas very probable, that he imploy'd Oyl of Sulphur, or of Vitriol, vvhich vvill scarce at all fret unalloy'd Silver. And however I concluded, that whatsoever the Event should prove, it could not but be worth the While to try, vvhat Operation such a Menstruum vvould have upon Sea-salt, as I vvvas sure had such a notable one upon salt-petre. And I remember, that formerly making some Experiments about the differing manners of Dissolution of the same Concrete by severall Liquors, I found, that Oyl of Vitriol dissolves Sea-salt in a very odd way, (vvhich you vvill find mention'd among my promiscuous Experiments,) vvherefore pouring, upon a solution of Bay-salt, made in but a moderate proportion of Water, Oyl of Vitriol to the full Weight of the dry Salt, and abstracting the Liquor in a Glasse Cucurbit plac'd in Sand, I obtain'd, without
 stress

stres of fire, besides flegme, good store of a Liquor, vvhich, by the Smel and Tast, seem'd to be spirit of Salt. And to satisfie my self the better, mingling a little of it vvith some of the spirit of Nitre lately mention'd, I found the mixture, even without the Assistance of Heat, to dissolve crude Gold. And having, for further Tryals sake, pour'd some of it upon spirit of fermented Urine, till the Affusion ceas'd to produce any Conflict, and having afterwards gently evaporated away the superfluous moisture, there did, as I expected, shoot, in the remaining Liquor, a Salt figur'd like Combs and Feathers, thereby disclosing it self to be much of the nature of Sal Armoniack, such as I elsewhere relate my having made, by mingling spirit of Urine vvith spirit of common Salt, made the ordinary way.]

This (*Pyrophilus*) is all I can find at present of that Account, of vvhich I hop'd to have found much more; but

you will be the more unconcern'd, for my not adding divers other things, that, I remember, I try'd, as vvell before and after the vvriting the above-transcrib'd Paper, (as particularly, that I found the Experiment sometimes to succeed not ill, when I distill'd the Oyl of Vitriol and Sea-salt together, without the intervention of Water, (whereby much time was sav'd,) and also when I imploy'd Oyl of Sulphur, made with a Glasse Bell, instead of Oyl of Vitriol,) if I inform You, that afterwards I found, that *Glauber* himself, in some of his subsequent pieces, had deliver'd more intelligibly the Way of making what he, without altogether so great a Brag, as most think, calls his *Sal mirabilis*, (which yet some very ingenious Readers of his Writings have come to Us to teach them,) and that those Experiments of his about it, which I vvas able to make succeed, (for some I was not, and some I did not think fit to try)

you

you will find, together with those of my Own, in more proper places of other Papers. Onely, to apply what hath been above related to my present purpose, I must not here pretermitt a couple of Observations.

And first we may take notice of the power, that Mixtures, though they seem but very slight, & consist of the smallest number of ingredients, may, if they make great changes of Texture, have, in altering the Nature and Qualities of the compounding Bodies. For in our (above recited) case, though Sea-salt be a Body considerably fix'd, requires a naked Fire to be elevated even by the help of copious additaments of beaten Bricks, or Clay, &c. to keep it from Fusion, yet the saline Corpuscles are distill'd over in a moderate Fire of Sand, whilst the Oyl of Vitriol, by whose intervention they acquire this volatility, though it be not (like the other) a Grosse or (as the same Chymist speaks) corporeal salt,

but a Liquor, that has been already distilled, is yet, by the same operation, so fix'd, as to stay behind, not onely in the Retort, but, as I have sometimes purposely try'd, in much considerabler heats then That needs in this Experiment be expos'd to. Nor onely is the oyl of Vitriol made thus far fix'd, but it is otherwise also no less chang'd. For when the remaining Salt has been expos'd to a competent heat, that it may be very drie and white, to be sure of which, I several times do, when the Distillation is ended, keep the remaining Masse (taken out of the Retort and beaten) in a Crucible among quick coals, you shall have a considerable quantity (perhaps near as much as the Sea-salt You first imploy'd) of a Substance, which, though not insipid, has not at all the tast of Sea-salt, or any other pungent one, and much lesse the highly corrosive acidity of Oyl of Vitriol.

And

And the mention of this substance leads me to the second particular I intended to take notice of, which is a *Phænomenon* to confirme what I formerly intimated, That notwithstanding the regular and exquisite figures of some Salts, they may, by the addition of other Bodies, be brought to constitute Chrystals of very differing, and yet of curious, shapes. For if You dissolve the hitherto mention'd *Caput mortuum* of Sea salt (after You have made it very dry, and freed it from all pungency of Taste) in a sufficient quantity of fair water, and, having filtrated the solution, suffer the dissolv'd Body leisurely to coagulate, You will probably obtain, as I have often done, Chrystals of a far greater Transparency, then the Cubes wherein Sea salt is wont to shoot, and of a shape far differing from theirs, though oftentimes no lesse Curious then that of those Cubes; and, which makes mainly for my present purpose, I have
often

often observ'd those finely figur'd Chrystals to differ as much in shape from one another, as from the Graines of common Salt. And indeed I must not, on this occasion, conceal from You, that whether it be to be imputed to the peculiar Nature of Sea salt, or (which I judge much more probable) to the great disparities to be met with in Liquors, that do all of them pass for Oyl of Vitriol, whether (I say) it be to this, or to some other cause, that the Effect is to be imputed, I have found my Attempts, to make the best sort of *Sal mirabilis*, subject to so much incertainty, that though I have divers times succeeded in them, I have found so little Uniformity in the success, as made me reckon this Experiment amongst Contingent ones, and almost weary of meddling with it.

Experiment

*Experiment VII. **

I Remember (*Pyrophilus*) I once made an Experiment, which, if I had had the Opportunity to repeat, and had done so with the like success, I should be tempted to look upon it, though not as a Lucriforous Experiment, (for tis the quite contrary,) yet as so Luciferous a one, as, how much soever it may serve to recommend Chymistry it self, may no lesse displease Envious Chymists, who will be troubled, both that one, who admits not their Principles, should

* Though this VII. Experiment, being considerable and very pertinent, the Author thought fit to mention it, such as it is here delivered, when he writ but to a private friend; yet, after he was induc'd to publish these Papers, twas the (now raging) Plague, which drove him from the Accommodations requisite to his purpose, that frustrated the Designe he had of first repeating that part of the Experiment, which treats of the Destruction of Gold: for as for that part, which teaches the Volatilization of it, he had tryed That often enough before.

devise

devise such a thing, and that having found it, he should not (Chymist like) keep it secret.

But to give you a plain and naked Account of this matter, that you may be able the better to judge of it, and, if You please, to repeat it, I will freely tell You, That supposing all Metals, as well as other Bodies, to be made of one Catholick Matter common to them all, and to differ but in the shape, size, motion or rest, and texture of the small parts they consist of, from which Affections of Matter, the Qualities, that difference particular Bodies, result, I could not see any impossibility in the Nature of the Thing, that one kind of Metal should be transmuted into another; (that being in effect no more, then that one Parcel of the Universal Matter, wherein all Bodies agree, may have a Texture produc'd in it, like the Texture of some other Parcel of the Matter common to them both,)

And

And having first suppos'd this, I further consider'd, That in a certain Menstruum, which, according to the vulgar Chymists doctrine, must be a worthless Liquor, according to my apprehension there must be an extraordinary efficacy in reference to Gold, not onely to dissolve, and otherwise alter it, but to injure the very Texture of that supposed-ly immutable Metal.

The Menstruum then I chose to try whether I could not dissolve Gold with, is made by pouring on the rectifi'd oyl of the Butter of Antimony as much strong spirit of Nitre, as would serve to præcipitate out of it all the *Bezoarticum Minerale*, and then with a good smart Fire distilling off all the Liquor, that would come over, and (if need be) Cohobating it upon the Antimonial powder. For though divers Chymists, that make this Liquor, throw it away, upon Presumption, that, because of the Ebullition, that is made by the Affusion of the

the spirit to the Oyl, and the consequent precipitation of a copious Powder, the Liquors have mutually destroy'd or disarm'd each other; yet my Notions and Experience of the Nature of some such Mixtures invites me to prize this, and give it the name of *Menstruum peracutum*.

Having then provided a sufficient quantity of this Liquor, (for I have observ'd that Gold ordinarily requires a far more copious Solvent then Silver,) we took a quantity of the best Gold we could get, and melted it with 3 or 4 times its weight of Copper, which Metal we choose rather then that which is more usual among the Refiners, Silver, that there may be the lesse suspicion, that there remain'd any Silver with the Gold, after their separation; this Mixture we put into good *Aqua fortis*, or spirit of Nitre, that all the Copper being dissolv'd, the Gold might be left pure and finely powder'd at the bottom; this

this Operation with *Aqua fortis* being accounted the best way of refining Gold that is yet known, and not subject, like Lead, to leave any Silver with it, since the *Aqua fortis* takes up that Metal. And for greater security, we gave the Powder to an Ancient Chymist, to boile some more of the Menstruum upon it, without communicating to him our Design. This highly refin'd Gold being, by a competent degree of heat, brought, as is usual, to its Native Colour and Lustre, we put to it a large Proportion of the *Menstruum peracutum*, (to which we have sometimes found cause to adde a little spirit of Salt, to promote the Solution,) wherein it dissolves slowly and quietly enough; and there remain'd at the bottom of the Glasse a pretty quantity (in shew, though not in weight) of white Powder, that the Menstruum would not touch, and, if I much misremember not, we found it as indissoluble in *Aqua Regis*.

Regis too. The Solution of Gold being abstracted, and the Gold again reduc'd into a Body, did, upon a second Solution, yield more of the white Powder, but not (if I remember aright) so much as at the first; now having some little quantity of this Powder, twas easie with Borax or some other convenient Flux, to melt it down into a Metal, which Metal we found to be white like Silver, and yielding to the Hammer, if not to a less pressure, and some of it, being dissolv'd in *Aqua fortis* or spirit of Nitre, did, by the odious Bitterness it produc'd, sufficiently confirm us in our Expectation, to find it true Silver.

I doubt not, but you will demand (*Pyrophilus*) why I did not make other Tryals with this Factitious Metal, to see in how many other Qualities I could verifie it to be Silver, but the quantity I recover'd after Fusion was so small, some of it perhaps being left either in the Flux, or in the Crucible, that I had
not

not wherewithall to make many Tryals, and being well enough satisfied by the visible Properties, and the Taste peculiar to Silver, both that it was a Metal, and rather Silver then any other, I was willing to keep the rest of it for a while, as a Rarity, before I made further Tryals with it; but was so unfortunate, as with it to loose it in a little Silver Box, where I had something of more Value, and possibly of more Curiosity.

You will also ask, why I repeated not the Experiment? to which I shall answer, that, besides that one may easily enough faile in making the Menstruum fit for my purpose, I did, when I had another Opportunity, (for I was long without it,) make a Second Attempt; and having, according to the above mention'd Method, brought it so far, that there remain'd nothing but the melting of the White Powder into Silver, when having wash'd it, I had layd it upon a piece of white Paper by the fires side to dry,

B b

being

being suddenly call'd out of my Chamber, an ignorant Maid, that in the mean time came to dress it up, unluckily swept this Paper, as a foul one, into the fire: which Discouragement, together with multiplicity of Occasions, have made me suspend the Pursuit of this Experiment, till another Opportunity. But in the mean time I was confirm'd in some part of my Conjecture by these Things.

The first, by finding, that with some other Menstruums which I try'd, and even with good *Aqua Regis* it self, I could obtain from the very best Gold, I dissolv'd in them, some little quantity of such a White Powder, as I was speaking of; but in so very small a proportion to the dissolv'd Gold, that I had never enough of it at once, to think it worth prosecuting Tryals with.

The other was this. That a very Experienc'd Mineralist, whom I had acquainted with part of what I had done, assur'd

assur'd me, that an eminently Learned and Judicious person, that he nam'd to me, had, by dissolving Gold in a certain kind of *Aqua Regis*, and after by reduction of it into a Body, redissolving it again, and repeating this Operation very often, reduc'd a very great, if not much the greater, part of an Ounce of Gold into such a White Powder.

And the Third thing, that confirm'd me, was, the Proof given me by some Tryals that I purposely made; That the *Menstruum peracutum* I imploy'd, had a notable Operation upon Gold, and would perform some things (one of which we shall by and by mention,) which Judicious Men, that play the great Criticks in Chymistry, do not think feasible: so that there seems no greater cause to doubt, that the above mention'd Silver was really obtain'd out of the pure Gold, then onely this, That Men have hitherto so often in vain attempted to make a real Transmutation

of Metals, (for the better or for the worse,) and to destroy the most fix'd and compacted Body of Gold, that the one is look'd upon as an Unpracticable Thing, and the other as an Indestructible Metal.

To reflect then a little upon what we have been relating, if we did not mistake nor impose upon our selves, (I say, upon our Selves, the Project being our own, and pursued without acquainting any body with our Aime,) it may afford us very considerable Consequences of great moment.

And in the First place, it seems probably reducible from hence, that however the Chymists are wont to talke irrationally enough of what they call *Tinctura Auri*, and *Anima Auri*; yet, in a sober sense, *some such thing* may be admitted, I say, *some such thing*, because as on the one hand, I would not countenance their wild Fancies about these matters, some of them being as unin-

telli-

telligible, as the Peripateticks substantial Forms, so, on the other hand, I would not readily deny, but that there may be some more noble and subtle Corpuscles, being duely conjoyn'd with the rest of the Matter, whereof Gold consists, may qualifie that Matter to look Yellow, to resist *Aqua fortis*, and to exhibit those other peculiar *Phænomena*, that discriminate Gold from Silver, and yet these Noble parts may either have their Texture destroy'd by a very piercing Menstruum, or by a greater congruity with its Corpuscles, then with those of the remaining part of the Gold, may stick more closer to the former, and by their means be extricated and drawn away from the latter. As when (to explain my meaning by a gross Example) the Corpuscles of Sulphur and Mercury do, by a strict Coalition, associate themselves into the Body we call Vermilion, though these will rise together in Sublimatory Vessels, without

Bb 3 being

being divorc'd by the fire, and will act, in many cases, as one Physical Body: yet tis known enough among Chymists, That if You exquisitely mix with it a due proportion of Salt of Tartar, the parts of the *Alkaly* will associate themselves more strictly with those of the Sulphur, then these were before associated with those of the Mercury, whereby You shall obtain out of the Cinnabar, which seem'd intensely red, a real Mercury, that will look like fluid Silver. And this Example prompts me to mind You, (*Pyrophilus*) That, at the begining of this Paragraph, I said no more, then that the Consequence, I have been deducing, might probably be inferr'd from the Premises. For as tis not absurd to think, that our Menstruum may have a particular Operation upon some Noble, and (if I may so call them) some Tinging parts of the Gold, so it is not impossible, but that the Yellowishness of that rich Metal
may

may proceed not from any particular Corpuscles of that Colour, but from the Texture of the Metal; as in our lately mention'd Example, the Cinna-
 bar was highly Red, though the Mer-
 cury, it consisted of, were Silver-colou-
 red, and the Sulphur but a pale Yellow;
 and consequently, the Whiteness, and
 other Changes, produc'd in the new
 Metal we obtain'd, may be attributed not
 to the Extraction of any tinging Parti-
 cles, but to a Change of Texture, where-
 on the Colour, as well as other Pro-
 perties of the Gold did depend. But
 That, which made me unwilling to re-
 ject the way, I first propos'd, of ex-
 plicating this Change of Colour, was,
 That a Mineralist of great Veracity hath
 several times assur'd me, that a known
 Person in the Relators Country, the
 Netherlands, got a great deal of Money
 by the way of Extracting a Blew Tin-
 cture out of Copper, so as to leave the
 Body White; adding, that he himself,

having procur'd from a friend (to satisfy his Curiosity) a little of the Menstruum, (whose chiefe Ingredients his friend communicated to him, and he to me,) he did, as he was directed, dissolve Copper in common *Aquá fortis*, to reduce it into small parts, and then having kept the *Calx* of the Powder of this Copper for some hours in this Menstruum, he perceiv'd, that the clear Liquor, which was weak in Taste, did not dissolve the Body of the Metal, but onely extract a blew Tincture, leaving behind a very White Powder, which he quickly reduc'd by Fusion into a Metal of the same Colour, which he found as Malleable as before. Which I the lesse wonder at, because the Experienc'd Chymist *Johannes Agricola*, in his Dutch Annotations upon *Peppius*, mentions the making of a White and Malleable Copper in good quantities upon his own knowledge; and that of such a kind of Copper, I have with pleasure made
Tryal,

Tryal, I elsewhere relate. But of these matters we may possibly say more in a convenient place.

The Second thing, that seems deducible from our former Narrative, is, That however most (for I say not all) of the Judiciousst among the Chymists themselves, as well as among their Adversaries, believe Gold too fix'd and permanent a Body to be changeable by Art, insomuch that tis a receiv'd Axiom amongst many Eminent Spagyrist, that *facilius est aurum construere, quàm destruere*; yet Gold it self is not absolutely indestructible by Art, since Gold being acknowledg'd to be an Homogeneous Metal, a part of it was, by our Experiment, really chang'd into a Body, that was either true Silver, or at least a new kind of Metal very differing from Gold. And since tis generally confess'd, that among all the Bodies we are allow'd to observe near enough, and to try our skill upon, there is not any, whose

whose Form is more strictly united to its Matter then that of Gold; and since also the Operation, by which the White Powder was produc'd, was made onely by a corrosive Liquor, without violence of Fire, it seems at least a very probable Inference, That there is not any Body of so constant and durable a Nature, but that, notwithstanding its persisting inviolated in the midst of divers sensible Disguises, its Texture, and consequently its Nature may be really destroy'd, in case this more powerful and appropriated Agent be brought by a due manner of Application to work upon the Body, whose Texture is to be destroy'd.

But this Matter we elsewhere handle, and therefore shall now proceed to the Last and chief Consecratories of our Experiment.

Thirdly then, it seems deducible from what we have deliver'd, that there may be a real Transmutation of one Metal into another, even among the perfectest
and

and noblest Metals, and that effected by Factitious Agents in a short time, and, if I may so speak, after a Mechanical manner. I speak not here of Projection, whereby one part of an Aurifick Powder is said to turn I know not how many 100 or 1000 parts of an ignobler Metal into Silver or Gold, not onely because, though Projection includes Transmutation, yet Transmutation is not all one with Projection, but far easier then it: but chiefly because tis not in this Discourse you are to expect what I can say, and do think, concerning what Men call the Philosophers Stone. To restrain my self then to the Experiment we are considering, that seems to teach us, that, at least among inanimate Bodies, the noblest and constantest sort of Forms are but peculiar Contrivances of the Matter, and may, by Agents, that work but Mechanically, that is, by locally moving the parts, and changing their Sizes, Shape, or Texture, be
gene-

generated and destroy'd, since we see, that in the same parcel of Metalline Matter, which a little before was true and pure Gold, by having some few of its parts withdrawn, and the rest transpos'd, or otherwise alter'd in their structure, (for there appears no token, that the Menstruum added any thing to the Matter of the produc'd Silver,) or by both these wayes together, the Form of Gold, or that peculiar Modification which made it Yellow, indissoluble in *Aqua fortis*, &c. is abolish'd, and from the new Texture of the same Matter, there arises that new Forme, or Convention of Accidents, from which we call a Metal Silver; and since Ours was not only dissoluble in *Aqua fortis*, but exhibited that excessively bitter Taste, which is peculiar to Silver, there seems no necessity to think, that there needs a distinct Agent, or a particular Action of a Substantial Form, to produce in a Natural Body the most peculiar and discriminating

ting Properties. For twas but the same Menstruum, devoid of Bitterness, that, by destroying the Texture of Gold, chang'd it into another, upon whose account it acquir'd at once both Whiteness in colour, Dissolublenesse in *Aqua fortis*, and aptnesse to compose a bitter Body with it, and I know not how many other new Qualities are attributed.

I know tis obvious to object, that tis no very thrifty way of Transmutation, instead of Exalting Silver to the condition of Gold, to degrade Gold to the condition of Silver. But a Transmutation is neverthelesse more or lesse real, for being or not being Lucriferous, and since That may enrich a Brain, that may impoverish a Purse, I must look upon your humour as that of an Alchymist, rather then of a Philosopher, if I durst not expect that the Instructiveness in such an Experiment will suffice to recommend it to You. And if I could have satisfied my self, that good Authors

thors are not mistaken about what they affirm of the Transmutation of Iron into Copper, though, the Charge and Pains consider'd, it be a matter of no Gain, yet I should have thought it an Experiment of great Worth, as well as the Transmutation of Silver into Gold. For tis no small matter to remove the Bounds, that Nature seems very industriously to have set to the Alterations of Bodies; especially among those Durable and almost Immortal Kinds, in whose Constancy to their first Forms, Nature seems to have design'd the shewing her self invincible by Art.

I should here (*Pyrophilus*) conclude what I have to say of the Experiment, that hath already so long entertain'd us, by recommending to You the repetition of what I had not the Opportunity to try above once from end to end, were it not, that I remember something I said about the *Menstruum peracutum*, may seem to import a Promise of communicating to
You

You something of the Efficacy of that Liquor upon Gold. And therefore partly for that reason, and partly to make sure, that the present Discourse shall not be uninstruative to You, I would adde, That though not onely the generality of Refiners and Mineralists, but divers of the most Judicious Cultivators of Chymistry it self, hold Gold to be so fix'd a Body, that it can as little be Volatiliz'd as Destroy'd, and that upon This ground, that the processes of subliming or distilling Gold to be met with in divers Chymical Books, are either mystical, or unpracticable, or fallacious, (in which Opinion I think them not much mistaken;) though Th's, I say, be the perswasion even of some critical Chymists, yet, upon the just Expectation I had to find my Menstruum very operative upon Gold, I attempted and found a way to Elevate it to a considerable height, but a far less proportion of Additament, then one that were
not

not fully perswaded of the possibility of Elevating Gold; and though I have indeed found, by two or three several Liquors, (especially the *Aqua pugilum*, ænigmatically describ'd by *Basilus*,) that the Fixedness of Gold is not altogether invincible, yet I found the Effect of these much inferior to that of our Mixture, touching which I shall relate to You the easiest and shortest, though not perhaps the very best, manner of employing it.

We take then the finest Gold we can procure, and having either Granulated it, or Laminated it, we dissolve it in a moderate heat, with a sufficient quantity of the *Menstruum peracutum*, and having carefully decanted the Solution into a conveniently siz'd Retort, we very gently in a Sand-Furnace distill off the *Menstruum*, and if we have a mind to elevate the more Gold, we either pour back upon the remaining substance the same *Menstruum*, or, which is better,

ter, redissolve it with fresh; the Liquor being abstracted, we urge the remaining Matter by degrees of Fire, and in no stronger a one, then what may easily be given in a Sand Furnace, a considerable quantity of the Gold will be Elevated to the upper part of the Retort, and either fall down in a Golden colour'd Liquor into the Receiver, or, which is more usual, fasten it self to the Top and Neck in the form of a Yellow or Reddish Sublimate, and sometimes we have had the Neck of the Retort enrich'd with good store of large thin Chrystals, not Yellow but Red, and most like Rubies, very glorious to behold; (though even these being taken out, and suffer'd to lie a due time in the open Air would loose their saline Form, and run *per Deliquium* into a Liquor.) Nor see I any cause to doubt, but that by the Reassusions of fresh Menstruum upon the dry *Calx* of Gold, that stayes behind, the whole Body of the Metal

Cc may

may be easily enough made to pass through the Retort, though, for a certain reason, I forbore to prosecute the Experiment so far.

But here (*Pyrophilus*) I think my self oblig'd to interpose a Caution, as well as to give you a further Information about our present Experiment. For first I must tell You, that though even Learned Chymists think it a sufficient proof of a true Tincture, that not onely the colour of the Concrete will not be separated by Distillation, but the extracting Liquor will pass over tinted into the Receiver, yet this supposition, though it be not unworthy of able men, may, in some cases, deceive them. And next I must tell You, that whereas I scruple not, in several Writings of mine, to teach, That the Particles of solid and consistent Bodies are not alwaies unfit to help to make up Fluid ones, I shall now venture to say further, That even a Liquor, made by Distillation,

how

how volatile soever such Liquors may be thought, may in part consist of Corpuscles of the most compact and ponderous Bodies in the World.

Now to manifest Both these things, and to shew You withall the Truth of what I elsewhere teach, *That some Bodies are of so durable a Texture, that their Minute parts will retain their own Nature, notwithstanding variety of Disguizes, which may impose, not onely upon other men, but upon Chymists themselves;* I will adde, that to prosecute the Experiment, I dropp'd into the Yellow Liquor afforded me by the Elevated Gold, a convenient quantity of clean running Mercury, which was immediately colour'd with a Golden colour'd Filme, and shaking it to and fro, till the Menstruum would guild no more, when I suppos'd the Gold to be all præcipitated upon the Mercury, I decanted the clarifi'd Liquor, and mixing the remaining *Amalgam* (if I may so call it) of

Cc 2

Gold

Gold and Mercury, with several times its Weight of Borax, I did, as I expected, by melting them in a small Crucible, easily recover the scatter'd Particles of the Elevated Metal, reduc'd into one little Mass or Bead of Corporal or Yellow (though perhaps somewhat palish) Gold. But yet whether the Gold, that tinged the Menstruum, might not, before the Metal was reduc'd or præcipitated out of it, have been more successfully apply'd to some considerable purposes, then a bare Solution of Gold, that hath never been Elevated, may be a Question, which I must not in this place determine, and some other things that I have try'd about our Elevated Gold, I have elsewhere taken notice of; Onely this further Use I shall here make of this Experiment, that, whereas I speak in other Papers, as if there may be a volatile Gold in some Oars, and other Minerals, where the Mine-men do not find any thing of that Metal, I mention such

a thing upon the Account of the past Experiment and some Analogies. And therefore as *I* would not be understood to adopt what every Chymical Writer is pleas'd to fancie concerning Volatile Gold; so *I* think Judicious men, that are not so well acquainted with Chymical Operations, are sometimes too forward to condemn the Chymists Observations; not because their Opinions have nothing of Truth, but because they have had the ill Luck not to be warily enough propos'd. And to give an instance in the Opinion, that some Minerals have a Volatile Gold, (and the like may be said of Silver,) *I* think *I* may give an Account, rational enough, of my admitting such a thing, by explicating it thus: That *as* in our Experiment, though after the almost total abstraction of the Menstruum, the remaining Body being true Gold, and consequently, in its own Nature, fix'd, yet it is so strictly associated with some volatile

saline Particles, that these, being press'd by the fire, carry up along with them the Corpuscles of the Gold, which may be reduc'd into a Mass by the admistion of Borax, or some other Body fitted to divorce the Corpuscles of the Metal from those, that would Elevate them, and to unite them into Grains, too big and ponderous to be sublim'd; so in some Mineral Bodies there may be pretty store of Corpuscles of Gold, so minute, and so blended with the unfix'd Particles, that they will be carried up together with them by so vehement a heat, as is wont to be imploy'd to bring Oars, and even Metalline masses to Fusion. And yet tis not impossible, but that these Corpuscles of Gold, that in ordinary Fusions fly away, may be detain'd and recover'd by some such proper *additament*, as may either work upon, and (to use a Chymical Term) mortifie the other parts of the Mass, without doing so upon the Gold; or by associating

sociating with the Volatile and ignobler
 Minerals, some way or other disable
 them to carry away the Gold with
 them, as they otherwise may do; or by
 its Fixedness and Cognation of Nature
 make the dispers'd Gold imbody with
 it. On which Occasion I remember,
 that a very Ingenious Man, desiring my
 Thoughts upon an Experiment, which
 he and some others, that were present at
 it, look'd upon as very strange. namely,
 that some good Gold, having, for a cer-
 tain Tryal, been cuppell'd with a great
 deal of Lead, instead of being advanc'd
 in Colour, as in Goodness, was grown
 manifestly paler then before; my Con-
 jecture being, That so great a Propor-
 tion of Lead might contain divers par-
 ticles of volatile Silver, which, meeting
 with the fix'd Body of the Gold, by in-
 corporating therewith, was detain'd,
 was much confirm'd by finding, upon
 Enquiry, that the Gold, instead of loo-
 sing its Weight, had it considerably in-

creas'd; which did much better answer my Ghess, then it did their Expectation, that made the Experiment, and were much surpriz'd at the Event. But this is no fit place to prosecute the consideration of the Additaments, that may be us'd to unite and fix the Particles of the nobler Metals, blended with volatile Bodies; though perhaps what hath been said may afford some Hint about the matter, as well as some Apology for the Chymical Term, Volatile Gold: the possibility of which, I presume, we have evinc'd by the latter part of this Experiment, (in which I am sorry I cannot remember the proportion of the remaining Salts, that were able to Elevate the Gold;) for That I have several times made, and therefore dare much more confidently rely on it, then I can press You to do on the former part, (about the Transmutation, or at least Destruction of Gold,) till You or I shall have Opportunity to repeat that Tryal.

Experiment

Experiment VIII.

THough (*Pyrophilus*) the Experiment, I am about to subjoin, may, at the first glance, seem onely to concern the *production of Tasts*, and be indeed one of the principal, that I devis'd concerning that subject, and that belongs to the Notes I have made about those Qualities: yet if You do not of your self take notice of it, I may hereafter have Occasion to shew You, that there are some particulars in this Experiment, that are applicable to more then Tasts. And since I had once thoughts (however since discouraged by the difficulties of the Attempt) to make my *Notes* extend even to *divers Qualities*, which the *operations of Chymists*, and the *practice of Physicians* have made men take notice of; (such as the powers of *corroding, precipitating, fixing, purging, blistering, stupifying, &c.*) I presume You will not dislike, that one, who had thoughts

thoughts to say something even of Chymical and of Medical Qualities, if I may so call them, should give You here an Experiment or two about more obvious, though *particular*, Affections of Bodies, when there are several things in the Experiment, that may be of a *general import* to the Doctrine of the Origine of Qualities and Forms.

We took then an Ounce of refined Silver, and having dissolv'd it in *Aqua fortis*, we suffer'd it to shoot into Chrystals, which being dried, we found to exceed the weight of the Silver by several Drachms, which accrued upon the coagulation of the acid Salts, that had dissolv'd, and were united to the Metal. These Chrystals we put into a Retort, and distill'd them in Sand, with almost as great a heat as we could give in a hammer'd Iron Furnace, wherein the Operation was made; but there came over onely a very little sowerish Flegm with an ill sent, wherefore the same Retort being suffer'd to cool, and then coated,

it was remov'd to another Furnace, capable of giving a far higher degree of Heat, namely, that of a naked fire, and in this Furnace the Distillation was pursued by the several degrees of heat, till at length the Retort came to be red hot, and kept so for a good while; but though even by this Operation there was very little driven over, yet That sufficiently manifested what we aimed at, shewing (namely) that a Body extremely Bitter might afford, as well as it consisted of, good store of parts that are not at all bitter, but (which is a very differing tast) eminently Sower. For our Receiver being taken off even when it was cold, the contain'd spirit smoak'd out like rectify'd *Aqua fortis*, and not onely smelt and tasted like *Aqua fortis*, to the Annoyance of the Nose and Tongue, but being pour'd upon Filings of crude Copper, it fell immediately to corrode them with violence, making much hissing, and sending

ding up thick fumes, and in a trice: produc'd, with the corroded Copper, a blewish colour, like That, which that Metal is wont to give in good *Aqua fortis*.

Afterwards we took *Minium* and *Aqua fortis*, and made a Solution, which being filtred and evaporated, left us a *Saccharum Saturni*, much like the common made with spirit of Vinegar, then taking this sweet Vitriol of Lead, (as we elsewhere call it) we endeavour'd in the formerly mention'd Sand Furnace to drive it over in a Retort; but finding That degree of fire incompetent to force over anything save a little flegmatick Liquor, we caus'd the Retort to be coated, and transferr'd to the other Furnace, where being urg'd with a naked Fire, it afforded at length a spirit somewhat more copious then the Silver had done. This Spirit smoak'd in the cold Receiver as the other had, and did, like it, rankly smell of *Aqua fortis*, and was so far from retaining any of the sweetness

ness of the Concrete that had yielded it, that it was offensively acid, and being pour'd upon *Minium*, it did with noise and Bubbles fall upon it, and quickly afforded us a Liquor, which being filtered, did, by its Sweetness as well as other proofs, assure us, that there would have needed but a gentle Evaporation (if We had leisure to make it) to obtain from it a true Sugar of Lead; and tis remarkable, that the Concrete, which appear'd White before Distillation, remain'd, for the most part, behind in the Retort in the form of a black *Caput mortuum*, (sometimes We have had it in a Yellowish Lump,) which was neither at all sweet, as the Vitriol of Lead it self had eminently been, nor at all sour, as the Liquor, distill'd from it, was in a high degree, but seem'd rather insipid, and was indeed but a *Calx* of Lead, which the heat of the fire had in part reduc'd into true and manifest Lead in the Retort it self, as appear'd by many

ny Grains of several Sizes, that We met with in the *Caput mortuum*, (the rest of which is easily enough reducible by fusion with a convenient flux into malleable Lead it self.)

There are some *Phænomena* of this Experiment, that We may elsewhere have Occasion to take notice of, as particularly, That, notwithstanding Silver be a Body so fix'd in the fire, that it will (as tis generally known) endure the Coppel it self, and though in the dry'd Chrystals of Silver, the Salt, that adheres to the Silver, increases the weight of the Metal but about a 4th or a 3^d part, yet this small proportion of saline Corpuscles was able to carry up so much of that almost fixedst of Bodies, that, more then once, We have had the inside of the Retort, to a great height, so cover'd over with the Metalline Corpuscles, that the Glass seem'd to be Silver'd over, and could hardly, by long scraping, be freed from the copious and closely adhering Sublimate.

But

But the *Phenomenon*, that I chiefly desire to take notice of at present, is this, That not onely *Aqua fortis*, being concoagulated with differing Bodies, may produce very differing Concretes, but the same numerical Saline Corpuscles, that, being associated with those of one Metal, had already produc'd a Body eminent in one Taste, may afterwards, being freed from that Body, compose a Liquor eminent for a very differing Taste; and after That too, being combin'd with the particles of another Metal, would with them constitute a Body of a very eminent Taste, as opposite as any one can be to both the other Tastes; and yet these Saline Corpuscles, if, instead of this second Metal, they should be associated with such a one as That, they are driven from, would therewith exhibit again the first of the three mention'd Tastes. To prove all this, We took Chrystals of refined Silver made with *Aqua fortis*, and though these Chrystals be, as We often

often note, superlatively bitter; yet having, by a naked fire, extorted from them what Spirit we could, and found That, as we expected, extremely Acid, we put one part of it upon a few Filings of Silver, of which it readily made a Solution more bitter then Gall, and the other part of the distill'd Liquor We poured upon *Minium*: and though, whilst it had been an Ingredient of the Chrystals of Silver committed to Distillation, it did with that Metal compose an excessively bitter substance, yet the same Particles, being loosned from that Metal, and associated with those of the Lead, did with them constitute a Solution, which by Evaporation afforded us a *Saccharum Saturni*, or a Vitriol sweet as Sugar. And for further confirmation, We varied the Experiment, having, in a naked Fire, distilled some dry'd *Saccharum Saturni* made with *Aqua fortis*, the little Liquor that came over, in proportion to the Body, that
afforded

afforded it, was so strong a spirit of Nitre, that for several hours the Receiver was fill'd with red Fumes; and though the smoaking Liquor were hugely sharp, yet part of it, being pour'd upon a piece of its own *Caput mortuum*, (in vvhich We perceiv'd not any Taste) did at length (for it vvrought but very slowly) exhibit some little Grains of a Saccharine Vitriol, but the other part, being put upon Filings of Silver, fell upon it immediately vvith noise and store of smoak, and a vvhile after con-coagulated vvith part of it (vvhich it had dissolv'd) into a Salt excessively bitter.

Experiment IX.

THe Artificial Transmutation of Bodies, being as the rarest and difficultest Production, so one of the noblest and usefullest Effects of Humane skill and power, not onely the clear Instances

D d

stances of it are to be diligently sought for and priz'd, but even the Probabilities of effecting such an extraordinary Change of Bodies are not to be neglected; especially, if the Version, hop'd for, be to be made betwixt Bodies of Primordial Textures, (if I may so call them,) and such Bodies, as by the greatness of their Bulk, and by their being to be found in most of the mix'd Bodies here below, make a considerable part of those, that we Men have the most immediately to do with. Invited by these considerations, *Pyrophilus*, I shall venture to give you the *Account* of some Observations, and Tryals, about the Transmuting of Water into Earth, though it be not so perfect as I Wish, and as I Hope, by Gods blessing, ~~so~~ make it.

The first Occasion, afforded me to do any thing about this matter, was my being consulted by a Gentleman, (an ancient Chymist, but not at all a Philosopher,) who relating to me how much he

had

had (with the wonted success of such Attempts) labour'd after the Grand *Arcana*, complain'd to me among other things, that, having Occasion to imploy great quantity of purifi'd Rain-water, he obtain'd from it much *less* then he wish'd of the substance that he look'd for, but a *great deal* of a certain whitish excrementitious Matter, which he knew not what to make of. This gave me the Curiosity first to desire a sight of it, in case he had not thrown it away, (which by good fortune he had not,) and then, taking notice of the unexpected plenty, and some of the Qualities of it, to ask him some Questions which were requisite and sufficient to perswade me, that this Residence came not from accidental foulness of the Water, nor of the Vessels twas receiv'd in. This I afterwards often thought of, and indeed it might justly enough awaken some suspicions, that the little Motes, that have been sometimes observ'd to appear

numerous enough, in pure Rain water whilst it is distilling, might not be meerly accidental, but really produc'd, as well as exhibited by the action of the Fire. I thought it then worth while to prosecute this matter a little farther: And having put a pretty quantity of distill'd Rainwater in a clean Glass Body, and fitted it with a Head and a Receiver, I suffer'd it to stand in a Digestive Furnace, till, by the gentle heat thereof, the Water was totally abstracted, and the Vessel left dry: which being taken out of the Sand, I found the bottom of the Glass all cover'd over with a white (but not so very white) substance; which, being scrap'd off vwith a Knife, appear'd to be a fine Earth, in vvhich I perceiv'd no manifest Taste, and vvhich, in a vvord, by several Qualities seem'd to be Earth.

This encourag'd me to redistill the Rain-water in the same Glass Body, vvwhose Bottom, vvhen the Water vvvas
all

all drawn off, afforded me more of the like Earth: but though the Repetition of the Experiment, and my having, for greater caution, try'd it all the while in a new Glass, that had not been imploy'd before to other uses, confirm'd me much in my conjecture, That unless it could be prov'd, which I think will scarce be pretended, that so insipid a Liquor as Rain-water should, in so gentle a heat, dissolve the most close and almost Indestructible Body of Glass it self, (which such corrosive Menstruums as *Aqua fortis*, and *Aqua Regis* are wont to leave unharm'd,) the Earthy powder, I obtain'd from already distill'd Rain water, might be a Transmutation of some parts of the Water into that substance, yet having unhappily lost part of my Powder, and consum'd almost all the rest, (for I kept a little by me, which you may yet see,) I should, till I had more frequently reiterated my Experiments, (which then I had not Opportunity to

do, though I had thoughts of doing it also with Snow-water, that I had put into Chymical Glasses for that purpose, and with liquor of melted Hail, which I had likewise provided,) and thereby also obtain'd some more of this Virgin Earth (as divers Chymists would call it) to make farther Tryals with, have retain'd greater suspicions, if I had not afterwards accidentally fall'n into discourse of this matter with a learned Physician, vvho had dealt much in Rain-vvater, but he much confirmed me in my conjecture, by assuring me, that he had frequently found such a White Earth, as I mention'd, in distill'd Rain Water, after he had distill'd the same Numerical Liquor (carefully gather'd at first) I know not how many times one after another, adding, that he did not find (any more then I had done) any cause to suspect, that if he had continu'd to redistill the same portion of Water, it would have yielded him more Earth.

But

But the Odness of the Experiment still keeping me in suspence, it was not without much delight, that afterwards mentioning it to a very Ingenious Person, whom, without his leave, I think not fit to name, well vers'd in Chymical matters, and whom I suspected to have, in order to some Medicines, long wrought upon Rain vvater, he readily gave me such an Account of his proceedings, as seem'd to leave little scruple about the Transmutation we have been mentioning: for he solemnly affirm'd to me, that having observ'd, as I had done, that Rain-vvater would, even after a Distillation or two, afford a Terrestrial substance, which may sometimes be seen swimming up and down in the Limpid Liquor, he had the Curiosity, being settled and at leisure, to try how long he could obtain this substance from the Water. And accordingly having freed Rain Water, carefully collected, from its accidental, and as it vv ere faculent

Earthiness, vvhich it vvill depofite at the first flowv Distillation, (and vvhich is oftentimes colour'd, vvhereby it may be diftinguifh'd from the White Earth made by Transmutation,) he rediftill'd it in very clean Glaifes, not onely 8 or 10 times, but neer 200, vvithout finding that his Liquor grevv weary of affording him the White Earth, but rather that the Corpuscles of it did appear far more numerous, or at leaft more conspicuous in the latter Distillation, then in the former. And vvhen I expreffed my Curiofity to fee this Earth, he readily fhew'd me a pretty quantity of it, and prefented me vvith fome, vvhich comparing vvith vvhat I had remaining of mine, I found to be exceeding like it, fave that it vvvas more purely White, as having been, for the main, afforded by Rain Water, that had been more frequently rectify'd. And to compare this welcome Powder with That I made my felf, I try'd with This
divers

divers things, which I had before try'd
 with my own, and (because the quanti-
 ty presented me was less inconsiderable)
 some others too. For I observ'd in this
 new Powder, as I had done with my
 Own, that being put into an excellent
 Microscope, and plac'd where the Sun
 beams might fall upon it, it appear'd a
 White Meal, or heap of Corpuscles so
 exceeding, not to say unimaginably,
 small, that, in two or three choice Mi-
 croscopes, both I and others had occasi-
 on to admire it, and their extreme Lit-
 tleness was much more sensibly dis-
 cern'd, by mingling some few Grains
 of Sand amongst them, which made a
 Mixture that look'd like that of Pibble
 stones, and of the finest Flower. For
 our Earth, even in the Microscope, ap-
 pear'd to consist of as small Particles, as
 the finest Hair-powder to the naked
 Eye. Nor could We discern this Dust
 to be transparent, though, when the Sun
 shin'd upon it, it appear'd in the Micro-
 scope

scope to have some Particles a little glistering, which yet, appearing but in a glaring light, we were not sure to be no *deceptio visûs*. 2. I found, that our White Powder, being cast into Water, would indeed for a while discolour it by somewhat Whitening it, which is no more then Spaud will do, and the fine dust of white Marble, and other stones, whose Corpuscles, by reason of their Minuteness, swimme easily for a while in the Water, but when it was once settled at the bottom, it continu'd there undissolv'd (for ought I could perceive) for some dayes and nights, as Earth would have done. 3. Having weigh'd a quantity of it, and put it into a new clean Crucible, with another inverted over it for a Cover, I plac'd it among quick Coals, and there kept the Crucible red hot for a pretty while, causing the Fire afterward to be acuated with a blast of a Bellows, but taking out the Powder, I neither found it melted, nor clotted

clotted into lumps, nor, when I weigh'd it again, did I see cause to conclude that there was much of it wasted, besides what stuck to the sides of the Crucible, and to a little Clay, vvherewith I had luted on the Cover, and which (to shew you, that the Heat had not been inconsiderable) was in several places burnt red by the vehemence of the fire; and when I afterwards kept this Powder in an open Crucible among glowing coals, neither I, nor one that I employ'd to assist me, perceiv'd it all to smoak; and having put a little upon a quick Coal, and blown That too, I found that which I had not blown away, to remain fix'd (which some Bodies will not do) upon quick Coals, that will endure the fire in a red hot Crucible. 4. I found this powder to be much heavier *in specie* then VVater. For employing a nice pair of Gold Scales, and a Method that would be too long here to describe, I found that this Powder weigh'd somevvhat
 (though

(though not much) more then twice
 so much common VVater, as vvvas equal
 to it in Bulk. And least some Corolla-
 ries, that seem obviously contain'd in
 the common, but groundless, concepts
 of the Peripateticks, about the Propor-
 tions of the Elements in Density &c.
 should make you expect, that this pov-
 der ought to have been much more
 ponderous, I shall adde, that having
 had the Curiosity, vvvhich I wonder no
 body should have before me, to examine
 the Gravity of the Earth, which seems
 the most Elementary of any we have, I
 took some sifted Wood-ashes, which I
 had caus'd to be three or four times
 boyl'd in a plentiful proportion of Wa-
 ter, to free them from Salt, and ha-
 ving put them very dry into common
 Water, I found them but little heavier
 then our newly mention'd Powder, sur-
 passing in weight Water of the same
 Bulk but twice, and a little more then a
 6th part, (Water and It being very little

more

more then as 1 to 2 $\frac{1}{2}$.) And that you may the less doubt of this, I will yet subjoyn, that, examining the Specifick Gravity of (white) Glas it self, I found that compact Body to be very little, if at all more then 2 times and a half as heavy as Water of equal Bigness to it. So that the Gravity of that Powder, which, borrowing a Chymical term, we have been calling Virgin-Earth, being added to its Fixtness, and other Qualities, it may seem no great impropriety of Speech to name it Earth, at least, if by Earth we mean not the pure Elementary Earth of the Schools, which many of themselves confesse not to be found actually separate, but a Body dry, cold, ponderous, induring the fire, and, which is the main, irresoluble by Water and Fire into other Bodies specifically different.

[But to return to the Guise of the Powder, when I ask'd this Learned man, whether he observ'd the Glas he distill'd

still'd in to have been fretted by the Liquor, and whether This lost of its Substance, according as it deposited more Powder, He answer'd me, (and he is a Person of unsuspected Credit,) that he found not his Glass to have been injur'd by the Liquor, and that the Water wasted (though he were carefull it should not do so by Evaporation and Transfusions) by degrees so much, that there remain'd, by his æstimate, but about an 8th part of the first quantity: and though, for certain reasons, he kept by him the Liquor last distill'd, yet he doubted not, but that it might be very nigh totally brought into Earth, since out of an Ounce of distill'd Rain-water he had already obtain'd near 3 quarters of an Ounce, if not more, of the often mention'd Earth.]

These several Relations will, I suppose, perswade You, *Pyrophilus*, that this Experiment is hopeful enough to be well worth your pursuing, if not that
per,

perhaps none but such a scrupulous Person as I, would think the prosecution of it other then superfluous. And if You do acquiesce in what hath been already done, you will, I presume, think it no mean confirmation of the Corpuscularian Principles, and *Hypotheses*. For if, contrary to the Opinion that is so much in request among the generality of modern Physicians and other Learned Men, that the Elements themselves are transmuted into one another, and those simple and Primitive Bodies, which Nature is presum'd to have intended to be the stable and permanent ingredients of the Bodies she compounds here below, may be artificially destroy'd, and (without the intervention of a Seminal and Plastick power) generated or produc'd. if, I say, this may be done, and that by such slight means, why may We not think, that the Changes and Metamorphoses, that happen in other Bodies, which are acknowledg'd by the Moderns

derns to be far more lyable to Alterations, may proceed from the Local Motion of the minute or insensible parts of Matter, and the Changes of Texture that may be consequent thereunto? Some bold Atomists would here be determining, by what particular Ways this strange Transmutation of Water into Earth may be perform'd, and would perchance particularly tell you, how the continually, but slowly, agitated parts of the Water, by their innumerable occurrences, may by degrees rub, and as it were grind themselves into such Surfaces, as *either* to stick very close to one another by immediate contact, (as I elsewhere observe polish'd pieces of Glass to do,) *or* implicate, and intangle themselves together so, as to make, as it were, little *knots*; which knots (he would add,) *or* the newly mention'd *clusters* of coherent Particles, being then grown too great and heavy to be supported by the Water, must subside to the bottom in the

the form of a Powder, which, by reason of the same Gravity of these *Moleculæ*, and the strict Union of the lesser particles that compose them, obtain an *indisposition to dissolve in water*, and to be *elevated or dissipated by the fire*; as their *Inspidness* may be accounted for by its being but the same with that of the Liquor, whence they were made, and their *Transparency* by that of the Water they were made of, and by the multitude of the little Surfaces that belong to so fine a Powder. But though in favour of such conjectures, I could somewhat illustrate them, *partly* by applying to this Occasion what I elsewhere observe of the reducing of the fluid Body of Quicksilver by a bare Circulation, (which is but a repeated Distillation) with a proportionable heat, into a real Powder, vvhich also vvill not so easily be rais'd by the fire, as the fluid Body, vvhen by change of Texture it was made, and *partly* by subjoining,

E e mong

mong other things, how by the conjunction of two distill'd Liquors digested together, I have obtain'd good store of an insipid Substance, that would not dissolve in Water, and that would long enough indure no inconsiderable degree of Fire; though, I say, by these and other such particulars, I could make our Atomists conjectures lesse improbable, yet the full disquisition of so difficult a Subject is too long and intricate to be proper for this place. *

And therefore, without here examining our Atomists explication of this *Metamorphosis*, we will give him leave for a while to suppose the Transmutation it self to be real, and thereupon to consider, whether the Historical part of it do not much disfavour some of the chief Doctrines of the Chymists, and a

*What is here delivered may be, for the main, verified by what the Reader will meet with in the (following) Xth. Experiment, though That be not It which the Author meant.

fundamental one of *Helmonts*. For if the purest Water may be turn'd into Earth, it will not be easie to make it improbable, that the other Ingredients of mixt Bodies, which the Chymists call their Hypostatical Principles, are capable of being transmuted into one another, which would overthrow one of the main Foundations of their whole Philosophy; and besides, if out of the simplest Water it self, a moderate fire can produce a large proportion of Earth, that was not formally præexistent in it, how shall We be sure, that in all the *Analyses*, which the Fire makes of mixt Bodies, the Substances thereby exhibited are obtain'd by Separation onely, without any Transmutation? As for *Helmont*, tis well enough known, that he makes Water to be the Material Principle of all Bodies here below, which he vvould have to be either Water it self, or but Water disguis'd by those Forms, vvhich the Seeds of

Ee 2

things

things have given it. I will not here examine, whether this Opinion, if he had restrain'd it to Animals and Vegetables, might not, with some restriction and explanations, be kept from appearing absurd, since my *Eleutherius* hath (though without absolutely adopting it) elsewhere pleaded for its not being so extravagant, as it hath been thought.

But whereas *Helmont's* Grand Argument from Experience is grounded on this, That the Alkahest doth, as he affirms, by being digested with, and distill'd from other tangible Bodies, reduce them all at last into a Liquor, no way differing from Rain Water, though we should grant the matter of fact, yet the Experiment of our Powder will warrant me to question their Ratiocination. For if all mix'd Bodies be therefore concluded to be materially from Water, because they are, by the Operation of the Fire, and a Menstruum, after having pass'd through divers prævious Changes,

Changes, reduc'd at length into insipid Water; by the same way of arguing (and with greater cogency) I might conclude, that all those Bodies are materially but disguis'd Earth, since without intervention of a Seminal Principle, (for *Helmont* will not allow that Title to Fire, which he styles the Artificial Death of Things) Water it self may be turn'd into Earth. Indeed if that acute Chymist were now alive, and had such an immortal Liquor, as he describes his *Alkabeft* to be, I would gladly put him upon trying whether that Menstruum would reduce our White Earth into Water. But there being no more probability of that, then that such reproduc'd Water, being just what it vvas before, might be turn'd into Earth again; it may be probably said, that since these Bodies are mutually convertible into one another, (and, as to the version of Water into Earth, by a seemingly slight Operation,) they are not either of them ingenerable and

incorruptible Elements, much less the sole matter of all tangible Bodies, but onely two of the Primordial, and of the most obvious Schematisms of that, which is indeed the universal Matter, vvvhich, as it comes to have its minute Particles associated after this or that manner, may, by a change of their Texture and Motion, constitute, with the same Corpuscles, sometimes Water, and sometimes Earth.

But (*Pyrophilus*) to leave these Reflexions, to return to the bold Conjectures that they are grounded on; though if I had leisure and indulgence enough, I could, I confess, add many things in favour of some of those Thoughts:* yet I would not have you wonder, that, whilst I vvvas mentioning

* Of the possible wayes of turning Liquors into consistent Bodies, by bending, breaking, twisting, and by otherwise changing the Texture of the Liquor, see more particularly the *History of Fluidity and Firmnesse*, published by the Author.

the many particulars, that seem to evince the change of Water into Earth, I should let fall some Words, that intimate a Diffidence about it. For, to disguise nothing unto You, I must confess, that having, in spite of an unusual care, unluckily lost a whole paper of the Powder I had made my self, and having unexpectedly been oblig'd to remove from my Furnaces, before I had made half the Tryals I judg'd requisite in so nice a case, I have not yet laid aside all my Scruples.

For 1. I would gladly know, whether the untransmuted Rain water, by the deposition of so much Terrestrial Matter, were grown lighter *in specie* then before, or sharp in tast. Next, I would be thoroughly satisfied, (which I confess I am not yet, notwithstanding all that the followers of *Angelus Sala* have confidently enough written,) whether and how far insipid Liquors (as Rain Water is) may, or may not vvork as Men-

struums upon Stones or Earthy Bodies: not to question, vvwhether the Particles of Rain Water may not, by their mutual Attrition, or some other action upon one another, be reduc'd into Shapes and Sizes fit to compose such a Menstruum, as the Liquor was not before; as in divers Plants, that seem to be nourish'd onely with Water, the Sap is endow'd with a sharp Tast, and great penetrancy, and activity of parts.

2. It were also fit to know, whether the Glas Body, wherein all the Distillations are made, do loose of its VVeight any thing neer so much, as the obtained Powder amounts to, over and above the Decrement of VVeight, which may be imputed to the action of the Heat upon the substance of the Glas, in case it appear by another Glas, kept empty in an equal heat, and for the same time that the Glas looses by such Operations any thing worth reckoning. And it vvwere also not impertinent to try, whether
the

the Gravity of the obtain'd Powder be the same *in specie* with that of the Glafs; vvherein the Distillations were made: (for that it *differ'd but about a 5th part* from the weight of Chrystalline Glafs I lately mention'd.) Which Scruple, and some of the former, I might have prevented, if I had had convenient Metal-line Vessels, wherein to make the Distillations instead of Glafs ones.

3. I could wish likewise that it were more demonstrably determin'd, what is on all hands taken for granted, (as it appears indeed highly probable,) that distill'd Rain Water is a perfectly Homogeneous Body, vvhich if it be not, divers suspicions might be suggested about its Transmutation into Earth, and if it be, 'twill be as a very strange thing, so a matter of very great difficulty to conceive, howv a perfectly and exquisitely Homogeneous Matter should, without any Addition, or any Seminal and Plastick Principle, be brought to af-

ford great store of a Matter of much more Specifick Gravity then it self, since we see, that no Aggregate we can make of Bodies but æquiponderant *in specie* with water, doth, by vertue of their Convention, grow specifically heavier then it.

4. Having had the Curiosity to try, whether Corrosive Liquors would work upon our white Powder, I found, that not onely good Oyl of Vitriol would corrode it, but strong and deflegm'd Spirit of Salt did readily work upon part of it, and that without the assistance of heat, though not without hissing, and exciting great store of bubbles, as I have known such Menstruums do, when put upon *Lapis Stellaris*, or *Ossifragus*, or some such soft Stone; as it that so much defæcated Rain-water, actuated by heat, had resolv'd some of the looser Corpuscles of the Sand or Stone, that, together with some Salts, compose common Glass, as I have observed

serv'd in some Petrifying VVater, that some of the Bodies I took up, and which were presum'd to be petrify'd, were but cruſted over with Stone, that ſeem'd generated but by the ſucceſſive appoſition of Stony Particles, that, lying inviſibly mingled with the running VVater, ſtuck in their paſſage to the conveniently diſpoſ'd Bodies that lay in the Streams way. But yet I muſt not omit, that, when I ſuffer'd this Mixture to ſettle, as much of the Powder, as ſeem'd to be a very great part of it, remain'd in the lower part of the Liquor, as if that had rather fretted then diſſolv'd it, and that not becauſe the Menſtrum was overcharg'd or glutted, as I found by putting in afterwards ſeveral freſh parcels of Powder, which it readily fell upon, not without noiſe and froth. Nor muſt I forget, that ſometimes I have excited ſuch an Ebullition, by powring the ſame Liquors upon the Earthy part of Wood-aſhes, ſeveral times waſh'd in
boy-

boyling water, (though, I confess, I afterwards somewhat suspected there might remain some little adhering *Alkaly*, which might occasion those Bubbles, notwithstanding that both I and another, whom I also invited to tast it, took the Earth to be quite Saltlesse.) I might (*Pyrophilus*) adde, that sometimes also me thought I found this Powder (which yet likewise sometimes hapned to me with the lately mention'd Earth of Wood-ashes) somewhat gritty between my Teeth, and subjoin divers other particulars, if it were not too tedious to mention to You all the doubts and considerations that have occur'd to me about the recited Change of Water into Earth: which yet are not such as ought to hinder me from giving You the Historical account I have set down, since to some of my Scruples I could here give plausible Answers, but that I cannot do it in few words. And if any part of our white Powder prove to be

true

true Earth, no body perhaps yet knows to what the Experiment may lead sagacious Men: and whether in a strict sense it be true Earth or no, yet the *Phænomena*, that are exhibited in the production of it, are sufficient to give this 9th Experiment a place among the others (of the same Decad) with which tis associated. For since out of a substance that is universally acknowledg'd to be Elementary and Homogeneous, and which manifestly is fluid, transparent, much lighter *in specie* then Earth, moist and fugitive, there is artificially generated or obtain'd a Substance consistent, vvwhite, and consequently opacous, comparatively ponderous, dry, and not at all fugitive; the Alteration is so great, and effected in so simple a way, that it cannot but afford us a considerable Instance of what the varied Texture of the minute parts may perform in a Matter confessedly similar. And if frequently distill'd Rain Water should not
be

be allow'd Homogeneous, our Experiment will at least shew us, better then perhaps any hath yet done, how little we are bound to believe what the Chymists, and others tell us, when they pretend manifestly to exhibit to us Homogeneous Principles, and Elementary Bodies, and how difficult it is to be certain when a Body is absolutely irresoluble into specifically differing Substances, and consequently what is the determinate number of the perfectly simple Ingredients of Bodies: (supposing that such there are.) Though I must confess, that my onely aime is not to Relate what hath been done, but to Procure the prosecution of it. For if the obtain'd Substance be, by the Rain Water, dissolv'd out of the Glasse, this will both prove a noble and surprizing Instance of what may be done by insipid Menstruums, even upon Bodies that are justly reckon'd among the compactest and most indissoluble that we know of, and
may

may afford us many other considerable hints, that have been partly intimated already: and if on the other side, this Powder, whether it be true Elementary Earth or not, be found to be really produc'd out of the Water it self, it may prove a *Magnale* in Nature, and of greater consequence then will be presently foreseen, and may make the Alchymists hopes of turning other Metals into Gold, appear less wild, since that by Experimentally evincing, that two such difficult Qualities to be introduc'd into a Body, as considerable degrees of Fixity & Weight, (whose requisitenesse to the making of Gold are two of the Principal things, that have kept me from easily expecting to find the Attempts of Alchymists succesful,) may, without the mixture of a Homogeneous Matter, be generated in it, by varying the Texture of its parts.

I will not now adventure to adde any thing of what I have been attempting
about

about the transmuting (without additaments) of pure Alkalizate Salts into Earth, because I do not yet know, whether the Tryals will answer my Hopes: (for I do not yet call them my Expectations.) But upon this subject of Transmutations, I could, if it did not properly belong to another Treatise, tell you something about the Changes, that may be wrought upon highly rectify'd Spirit of Wine, vvhich vvhould perchance make You think of other things of the like kind lesse infeasible: For vvhereas tis a known thing, that That spirituous Liquor being kindled, (and that, if you please, by other Spirit of Wine actually fir'd) will, for ought appears, burn all away, that is, be totally turn'd into flame; if I durst rely, in so important a case, on a couple of Tryals, whilst I hope for an Opportunity of making farther ones, I would tell You, that by a way unthought on (that I know of) by any Body, I have, without

vvithout any addition, obtain'd, from such Spirit of Wine, as, being kindled in a Spoon, would flame all away, without leaving the least drop behind it, a considerable quantity of downright incombustible Flegm. And by another way (mention'd indeed by *Helmont*, but not taught to almost any of his Readers) some Ingenious Persons, that you know and esteem, vvorking by my directions, (but vvithout knowing vvhat each other vvvas doing) did both of them reduce considerable quantities of high rectify'd Spirit of Wine (that vvould before have burnt all away) into a Liquor, that was for the most part flegm, as I vvvas inform'd as well by my own tast, as by the Tryals I order'd to be made: (being forc'd my self to be most commonly absent.) From which change of the greatest part of that at first liquid Splrit into Flegm, it seems deducible, that the same portion of Matter, vvhich, by being kindled, may be turn'd all into

F f

Fire,

Fire, may be, by another vvay of handling, turn'd into Flegm or Water, and this vvithout the addition of any thing, and vvithout being vvrought upon by any visible Body, but one so extremely dry as duely prepar'd Salt of Tartar; and that it self is not so indispensably necessary to the obtaining of flegm out of totally inflammable Spirit of Wine, but that, as I was saying, I did, by another way, obtain that dull Liquor vvithout imploying the Salt, or any other visible Body vvhatsoever. But I make a scruple to entertain you any longer with Extravagances of this Nature, and yet, if I were sure You vvould contain your smiles, I would adde for conclusion, That, if I had had time and Opportunity to furnish my self with any quantity of that Water, I had it in my thoughts to try, vvwhether that vvould have afforded me such a Terrestrial substance, as Rain Water had done, and thereby have undergone a new aud further *Metamorphosis.*

Experiment

The X. Experiment.

THere is one Experiment more, two of the chief *Phænomena* of vvhich belong to another Discourse; (vvhere I particularly mention Them,) and yet I shall conclude this little Treatise vvith the recitation of the Experiment it self, not onely because divers of the *Phænomena* do eminently belong to our present subject, but because I have scarce met vvith any Experiments more suitable to the Design I have of shewing, before I conclude this Discourse, vvhat great and sudden Productions and Destructions of Qualities may be effected by the composition of the smallest Number of Ingredients, even among Liquors themselves, and such too as are believ'd to be both of Them simple and Homogeneous, and incapable of Putrefaction, that so it may appear, what notable Alterations of Qualities

even seemingly slight and easie mixtures can perform among Bodies, both of them fluid, as well as among those that were either both of them stable, or one of them stable, and the other consistent.

Take then of good Oyl of Vitriol, and of Spirit of Wine, that will burn all away, equal parts, not in quantity, but in Weight; put them together by little and little, and having plac'd the Mixture in a Bolt-head, or Glass Egg with a long neck, and carefully stopp'd it with a Cork and hard Wax, set the Vessel in a moderate heat to digest for a competent while; (two or three weeks may do well,) then pour out the Mixture into a tall Glass Cucurbite, to which lute on a Head and a Receiver with extraordinary care, to prevent the Avolation of the Spirits, which will be very subtle: then with a very gentle fire abstract the spirit of Wine, that will first ascend, and when the Drops begin to
come

come over sowerish, shift the Receiver, and continue the Distillation with great care, that the Matter boyl not over, and when you judge that about half the acid Liquor is come over, it will not be amiss, though it be not necessary, to change the Receiver once more; but whether you do this or no, your Distillation must be continued, increasing the fire towards the latter end, till you have brought over all you can, and what remains in the bottom of the Cucurbite must be put into a Glass well stopp'd, to keep it from the Air.

NB. 1. That to the Production of most, if not of all the *Phanomena* of this Experiment, it is not absolutely necessary, that so long a Digestion, (not to say, not any,) be premis'd; though if the time above prescrib'd be allow'd, the Experiment will succeed the better.

2. That, I remember, I have sometimes made use of Oyl of Sulphur *per Campanam* (as they call it) instead of Oyl of

Vitriol, to produce the recited *Phænomena*; and though the Attempt succeeded not ill, as to divers particulars, yet I afterwards chose rather to imploy oyl of Vitriol, both because it did, in some points, better answer my Expectation then the other Liquor, and because I would not give occasion to suspect, that the Odours, hereafter to be mention'd as *Phænomena* of our Experiment, were due to the common Sulphur, whence the unctuous Liquor, made *per Campanam*, was obtain'd, as such, and did no way proceed from the acid Vitriolate Salt, which that Oyl (as tis improperly call'd) doth abound with'

3. That I had likewise the Curiosity to digest Oyl of Vitriol with Spanish Wine, instead of Spirit of Wine, by which means I obtain'd an odd Spirit, and residence, and some other *Phænomena*, which I content my self to have in this place given hint of, in regard that Wine being a Liquor of a much less simple nature then its Spirit,

the *Phænomena*, afforded me by This, are much fitter for my present purpose.

4. That great care must be had in regulating the fire, when once a good part of the Acid spirit, mention'd in the process, is come over. For if the Fire be not increas'd, the rest will scarce ascend, and if it be increas'd but a little too much, the Matter will be more apt, then one would suspect, to swell exceedingly in the Cucurbite, and perhaps run over into the Receiver, and spoil what it finds there, as it hath more then once hapned to me, when I was fain to commit the management of the Fire to others.

Now the oyl of Vitriol, and the spirit of Wine, being both of them distill'd Liquors, and the Latter of them several times redistill'd, and one of them being drawn from so simple and familiar a substance as Wine, and the other from a Concrete not more compounded, then what Nature her self (which, as I elsewhere shew, can, without the help of Art,

produce Vitriol) doth divers times present us with; these Liquors, I say, being both of them distill'd, and consequently volatile, one would expect, that by distilling them, they should be brought over united, as I have tryed, that the spirit of Wine, and of Nitre, or also of common Salt may be; and as the spirits of differing Vegetables are wont to be; or that, at least, the Distillation should not much alter them, from what it found them, after they had been well mingled together. But this notwithstanding, these two Liquors being of very odd Textures in reference to each other, their conjunction and distillation will make them exhibit divers considerable and perhaps surprizing *Phaenomena*.

For First, whereas spirit of Wine has no great Sent, nor no good one, and moderately deflegm'd Oyl of Vitriol is wont to be inodorous; the Spirit, that first comes over from our mixture, hath

a Sent not onely very differing from spirit of Wine but from all things else, that I remember, I ever smelt. And as this new Odour doth to almost all those, whose Opinions I have asked about it, seem very fragrant and pleasant, so I have sometimes had it so exceeding subtle, that, in spite of the care that was taken to lute the Glasses exactly together, it would perfume the neighbouring parts of the Laboratory, and would not afterwards be kept in by a close Cork, cover'd with two or three several Bladders, but smell strongly at some distance from the Viol wherein it was put, I did not think it unlikely, that so noble and piercing a Liquor might be of no mean efficacy in Physick; and though I miss'd of receiving an account of its Effects from some ingenious Physicians, into whose Hands I put it to have Tryals made of it, yet I cannot despair of finding it a considerable Medicine, when I remember, partly what
hath

hath been done by some acquaintances of mine with bare flegme of Vitriol, upon the account (as is suppos'd) of that little Sulphur of Vitriol, that, though but sparingly, doth enrich that Liquor; and partly, what the Masters of Chymical *Arcana* tell us of the wonderful vertues of the Volatile Sulphur of Vitriol, and what I have observ'd my self, that may invite me to have a good Opinion of Remedies of that nature.

2. But to shew how much the O-
dours of Bodies depend upon their
Texture, I shall now adde, That after
this volatile and odoriferous Spirit is
come over, and has been followed by
an Acid Spirit, it will usually, towards
the latter end of the Distillation, be suc-
ceeded by a Liquor, that is not onely not
fragrant, but stinks so strongly of Brim-
stone, that I have sometimes known it
almost take away the Breath (as they
speak) of those, who, when I had the
Receiver, newly taken off, in my hand,
did

did (either because to make sport I gave them no vvarning, or because they would not take it, as thinking what I told them impossible,) too boldly adventure their Noses in the Tryal.

3. There is in this Operation produc'd a Liquor, that will not mingle either with the fragrant, or with the foetid Spirit hitherto describ'd, but is very differing from both of them, and is so very pleasant, subtle, and Aromatical, that it is no less differing as well from Spirit of Wine, as Oyl of Vitriol. But of this Liquor I give a further Account in a more convenient place.

4. When the Distillation is carried on far enough, You will find at the bottom, that the two above mention'd Diaphanous Spirits (for Oyl of Vitriol is indeed rather a Saline Spirit, then an Oyl) have produc'd a pretty Quantity of a Substance, not onely very opacous, but black almost like Pitch or Jet.

5. And this Substance, though produc'd

duc'd by two Bodies, that were not only fluid, but distill'd, will not alone be consistent, but (if the Distillation have been urg'd far enough) brittle.

6. And though Spirit of Wine be reputed the most inflammable, and Oyl of Vitriol the most corrosive Liquor that is known, yet I could not find, that this black Substance would easily, if at all, be brought, I say not to flame, but to burn; nor that it had any discernible Taste, though both the Liquors, from whose mixture it was obtain'd, have exceeding strong and pungent Tastes.

7. And whereas both Oyl of Vitriol and Spirit of Wine will each of them more readily, then most Liquors that are yet known, mingle with common Water, and diffuse it self therein, I observ'd, that this pitchy Mass, if the Distillation had been continued till it was perfectly dry, would not, that I could perceive, dissolve in common water for very many hours, and, if I much misre-
member

member not, for some dayes:

8. And Lastly, whereas the Oyl of Vitriol, and the Spirit of Wine, were both of them distill'd Liquors, and one of them exceeding volatile and fugitive; yet the black Mass, produc'd by them, was so far fix'd, that I could not make it rise by a considerably strong and lasting fire, that would have rais'd a much more sluggish Body, then the heaviest of those that concurr'd to produce it.

The remaining particulars, that I have observ'd in this Experiment, belong to another Treatise, and therefore I shall forbear to mention them in this: nor shall I at present adde any new *Phænomena* to those I have already recited; those freshly mention'd Experiments, and those that preceded it, being, even without the assistance of the four Observations I have delivered before them, sufficient to manifest the Truth I have been endeavouring to make out, For in the Experiments we are speaking of,
it

it cannot well be *pretended*, or at least not well *prov'd*, that any Substantial Forms are the Causes of the Effects I have recited. For in most of the (above mention'd) cases, besides that, in the Bodies we imploy'd, the Seminal Ver-
 tues, if they had any before, may be suppos'd to have been destroy'd by the fire, they were such, as those I argue with would account to be *Factitious* Bodies, artificially produc'd by Chymical Operations. And tis not more manifest, that, in the production of these Effects, there intervenes a Local Motion, and change of Texture by these Operations, then tis inevident and precarious, that they are the Effects of such things, as the Schools fancy Substantial Forms to be: since tis, in these new Experiments, by the Addition of some new particles of Matter, or the Recess, or Expulsion of some præexistent ones, or, which is the most frequent way, by the Transposition of Minute parts, yet
 without

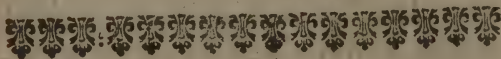
without quite excluding the other two, that no more skilful a Chymist then I have been able to produce by Art a not inconsiderable number of such changes of Qualities; that more notable ones are not ordinarily presented us by Nature, where she is presumed to work by the help of Substantial Forms; I see not, why-it may not be thought probable, that the same Catholick and fertile Principles, *Motion, Bulk, Shape, and Texture* of the Minute parts of *Matter*, may, under the Guidance of Nature, (whose Laws the modern Peripateticks acknowledge to be establish'd by the all-wise God,) suffice likewise to produce those other Qualities of Natural Bodies, of which we have not given particular Instances.

F I N I S.



ERRATA.

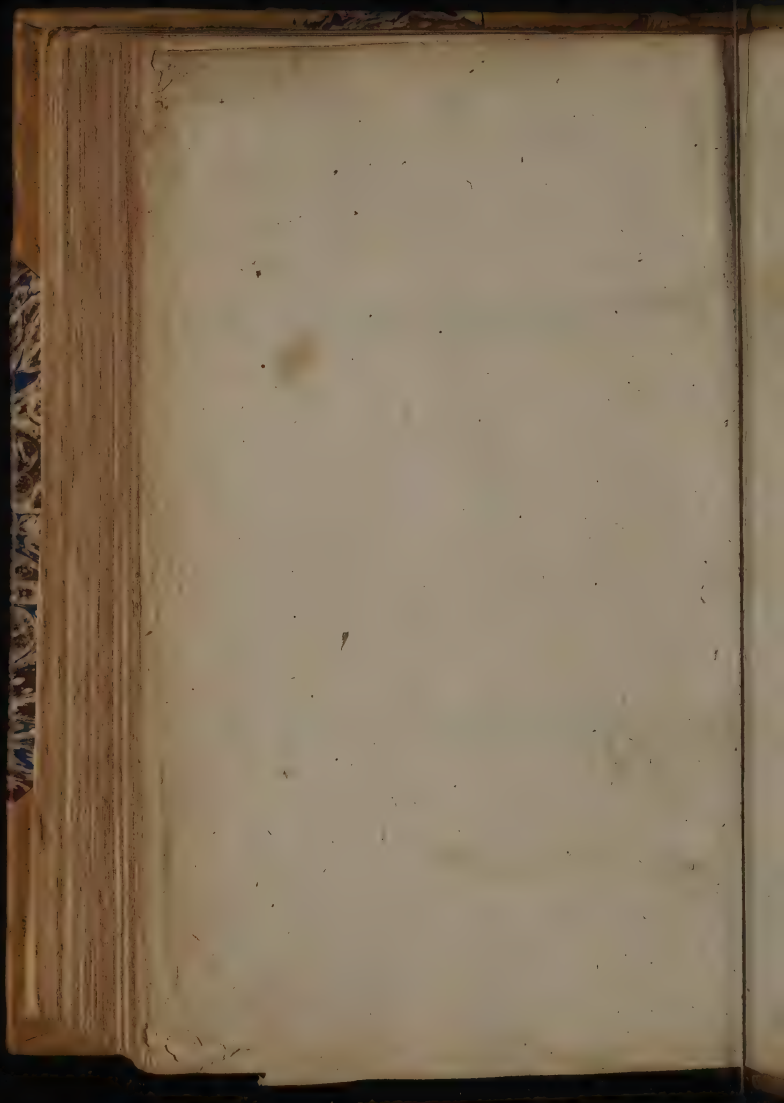
Præf. p. 11. l. ult. read aime. *præf.* p. 13. l. 13. r.
perhaps. p. 68. l. 13. r. destroyes. p. 130 l. 14.
r. Peare. p. 146. l. 20. r. Principle. p. 247.
l. 25. r. Fleurs. p. 231 l. 15. r. it. p. 325. l. 6.
a Comma at inflammable. p. 337. l. 7. r. of. p.
411. l. 7. r. former.





14.
47.
6.
P.

666
666
666



13

13

13

13

